ELECTRICAL REVIEW

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Managing Editor: HUGH S. POCOCK, M.I.E.E. *Technical Editor:* W. O. FENWICK, M.I.E.E.
Industrial Editor: J. H. COSENS *Technical Consultant:* C. O. BRETTELLE, M.I.E.E.

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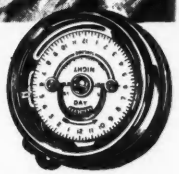

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ELECTRICAL REVIEW

3rd APRIL, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 14

The Electrical Way

LORD CITRINE, chairman of the British Electricity Authority, took the opportunity afforded by last week's housecraft advisers' and demonstrators' conference to present the case for domestic electricity. First he sought to clear the public mind of a few misapprehensions about electricity. He said, for instance, that the supply had been maintained with virtually no interruptions during the past two winters because the gap between supply and demand had been narrowed. He claimed that the electricity supply industry was now able to meet all the needs of consumers at all times, except during periods of very severe weather. It was stressed that this did not work any harm to industry. In fact in the last five years industrial consumption had risen by 50 per cent while that of domestic users had shown only a 30 per cent rise.

It is this last figure which is indicative of the present position of the supply industry. With the normal rate of expansion the domestic consumption would have kept pace with the industrial demand. Because it has not done so the country's generating plant is not being fully utilized in off-peak periods, i.e., most of the day. Load factor is thus about 47 per cent instead of a possible 60 or even 75 per cent. It is evident that if the higher figures could be reached the effect upon the cost of the unit would be appreciable. Not only would it enable the B.E.A. to take the increased cost of coal in its stride, it could conceivably lower the price of electricity. But even at present prices electricity is a good " buy." Rises in the cost of coal and gas have narrowed the unfavourable margin. Indeed it has been reported that in one Scottish housing estate sample tests have proved that all-electric houses are the cheapest to run. Apart from cost, the advantages inherent in the use of electricity are so great, both to the consumer and nationally, that for many years electricity practically sold itself when it was effectively brought to the public's notice by E.D.A. and the electricity supply authorities.

In recent times attempts to educate the public electrically have not been officially approved—a misguided policy which has benefited only the coal and gas industries, not the country or the public. Now, it seems possible, a more enlightened spirit is abroad and the industry may once again suggest to the housewife that the electrical way is the best way and that the generation of electricity, far from being anti-social, is the only satisfactory means of dealing with the large quantities of inferior fuel which the coal-mining industry produces, and, of course, there is also the consideration that eventually atomic power will be distributed electrically.

WOOD POLE PRESERVATION

Many thousands of wood poles now in use supporting overhead power lines are known to be, or suspected of being, affected by internal decay which can materially shorten the length of useful life in service of such poles. Of the remedial treatments which are being tried the most widely used is the " Cobra " process, although little information about its effectiveness seems to be available. Research into the subject initiated by the E.R.A. may take some time, but an investigation that has already been completed indicates, as explained on another page, that this treatment is effective in the vicinity of the ground line though it is not likely to be effective against decay occurring above about 18in from the ground level. In the service trials now proceeding an attempt is to be made to discover at what height in the pole such internal decay most frequently occurs.

ITALIAN DROUGHT

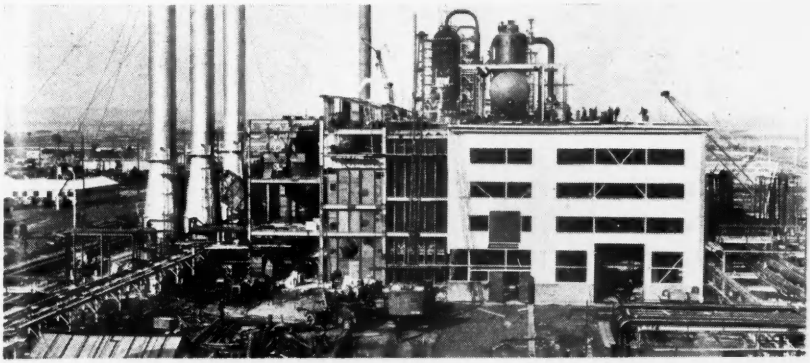
The period of dry weather in northern Italy, the most prolonged for ten years, is reported not to have interfered so far with the supply of electricity, seven-eighths of which is derived from water power. The deficiency has been made up by thermal stations, since some industries, notably textiles, are not just now working to capacity. In guarding against the effects of infrequent water shortages capital charges become of more importance than operation costs and the economical choice lies between providing the cheapest thermal plant (e.g., the simplest gas turbines) and greater water storage capacity.

NAVAL GAS TURBINES

The proposed use of gas turbines as speed boosters for large naval vessels, as well as for main propulsion of small warships, should provide valuable experience, particularly in regard to maintenance, for developments in land-type machines, whether for home or export purposes. The speed peaks are somewhat analogous to load peaks in electricity generating stations, though the peaks in the latter case are of longer duration; in both instances the base load would be carried by steam turbines. The difference is that the Admiralty uses oil normally, the additional cost of doing so being outweighed by advantages, vital in the circumstances, of saving in space and weight of fuel and of greater flexibility in operation.

DOMESTIC HEATING

In surveying problems raised by the growing scarcity and prices of coking coals at a recent joint meeting of the Institute of Fuel and the Coke Oven Managers' Association, Mr. H. D. Greenwood (National Coal Board) submitted that the amount of this type likely to be available by 1960 might not be enough to meet the demand both for metallurgical coke and for gas making. Conceding the priority claims of the iron and steel industry, those taking part in the discussion lent no support to the facile popular assumption that smokeless solid fuel will shortly be available for household use in the quantity and at the price requisite for general use.



Coryton Oil Refinery

Private Generation and Distribution Scheme

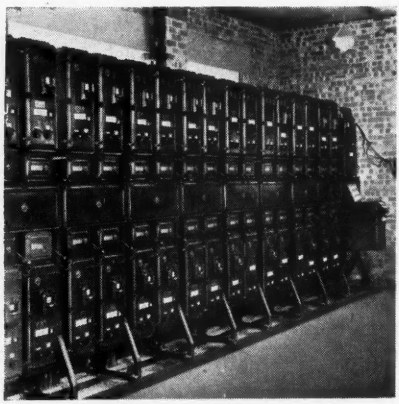
THE Vacuum Oil Company's new refinery at Coryton, of which the first section will soon be in commission, is completely self-contained electrically. The plant is provided with its own generating equipment, the boilers of which are fired principally with by-products of the refinery. There is a complete high voltage distribution system serving substations on most of the process units. The general layout makes provision for future extensions to the plant with the minimum of effort and expense. The techniques adopted for reducing possible risk of fire and explosions in the handling of highly inflammable materials are particularly interesting features of the design.

Although the company was registered in the United Kingdom as long ago as 1901 to carry on the business previously held in this country by the American parent company, it has not hitherto operated a full-scale oil refinery. Previously, the main processing operations carried out were oil compounding and blending and grease manufacturing in plants at Wandsworth and Birkenhead.

The new refinery now under construction is the major feature of the expansion which followed the arrangement entered into in 1950 whereby the Powell Duffryn Group, and Socony-Vacuum of New York, became joint and equal partners in Vacuum Oil. The refinery is designed to produce motor spirit (" Mobilgas Regular " and " Mobilgas Special "), diesel oil (" Mobil Diesel "), lubricants (" Mobiloil " and other widely-known brands), fuel oil and waxes. The refinery is sited on the northern bank of the lower reaches of the Thames and has good road, rail and water communications. Tankers of 30,000 tons and over can be accommodated at the jetties at any state of the tide.

The site layout is in the form of the letter " L." The northern leg is laid out for the processing of motor spirit, gas oil and fuel oil by the use of a two stage distillation unit (atmospheric and vacuum), thermal reformer and thermofor catalytic cracking plant. The catalytic cracking plant is the first of its kind in the United Kingdom and uses the air lift principle for returning regenerated catalyst to the reaction

A view of the turbo-generator section of the power plant looking north. In the background can be seen the two towers of the distillation unit



Motor starter panels remotely controlled from units

chamber. The eastern leg of the " L " is laid out for the refining of lubricating oils, comprising the propane de-asphalting unit, furfural treating unit, M.E.K. unit and the continuous percolation unit. Adjacent to these units are several smaller plants arranged for the treating and blending of motor spirit, packaging of waxes, etc. At the riverside, there is a water pumping station which provides cooling water to the power station and process units.

The plant is being commissioned unit by unit; it is expected that the last unit, which will be the catalytic cracking plant, will be operating by the end of this year. When completed, the refinery will process nearly a million tons of crude oil a year. For the future, provision has been made for duplication of existing units on sites reserved for this purpose. These sites are situated on the opposite side of the road from the existing units. The main pipe tracks have been so designed that they are sited between existing units and possible future units.

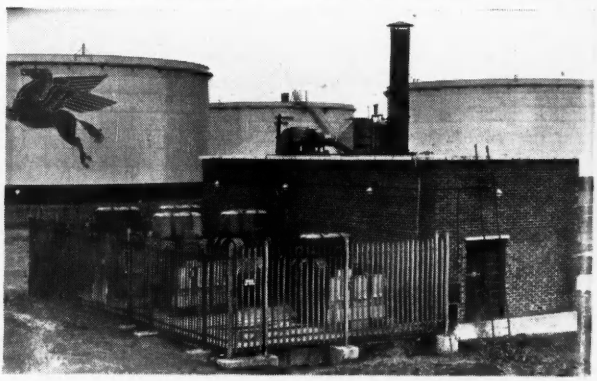
Refining processes are continuous and inter-related, and it follows that a shut-down of any single unit would cause a serious loss of output. For this reason every piece of equipment has been duplicated where practicable. In certain cases essential equipment has alternative electric and steam drives. To ensure consistently high quality of products an extensive system of instrumentation has been installed at the refinery for all stages of operations.

Each process requires constant control within close limits, whether it be of rate of flow, pressure, level or temperature. This is achieved automatically by means of instruments. Each may be an individual instrument or a combination of recording, controlling, indicating or integrating instruments. In addition to the process units, such plant as the cooling water intake, boiler house and other off-site facilities have their own individual types of instrumentation.

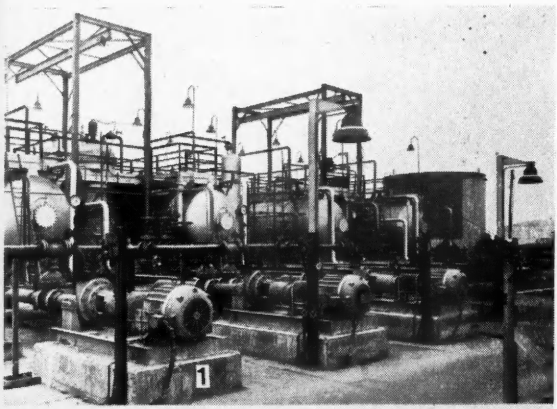
The water treating plant, which was the first unit to be completed, is capable of handling 50,000 gall of city water per hour. This plant includes two hot lime softeners and six hot zeolite softeners of which one lime softener and two zeolite softeners are used as stand-by. Condensate return is recirculated to the softeners and a flow meter of the recording and integrating type maintains a constant check on the make-up water. For practical reasons most of the lines and associated equipment from the lime softeners are duplicated.

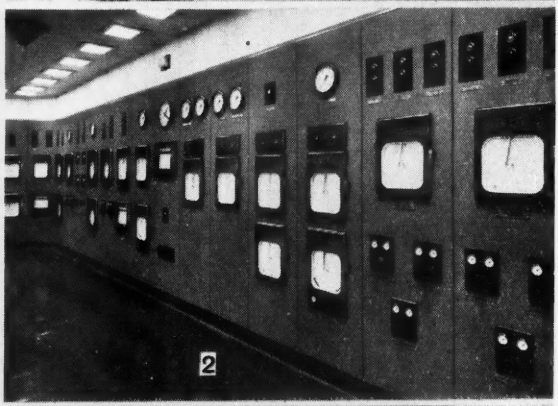
Flow from the softeners is recorded through transmitters to a 2-pen flow recorder on the main control panel. The

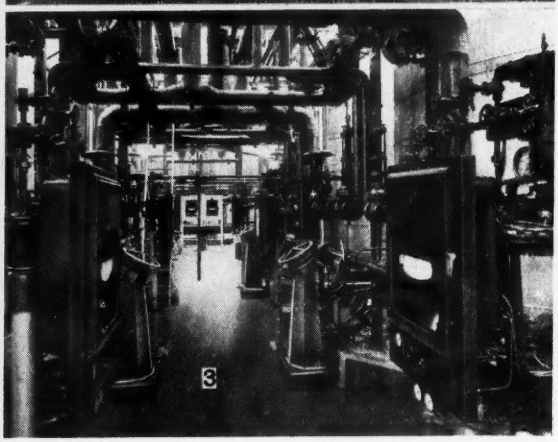
External view of typical switch-house showing transformer compound



(1) Low voltage switchgear in the switch-house. (2) One of the three 5,000 kW turbo-alternator sets. (3) One of the control panels in the turbine room. (4) E.h.v. switchgear in the switch-house. (5) Main electrical control room







total flow from the softeners is integrated and recorded. An interesting point about this instrument is that the integrator time impulse unit is housed within the transmitter and the reading transmitted to the integrator totalizer unit mounted above the flow recorder on the main control panel. The flow to each of the softeners is measured and controlled by local indicating pneumatic proportional and integral controllers, each continuously transmitting the actual rate of flow to two 3-pen recording receivers on the main control panel. The flow transmitters indicate the rate of flow of treated water from the softeners to the treated water storage.

Steam consumption at the water treating plant for pumps, etc., is recorded and indicated by local transmitters and 2-pen receivers, with separate integrator totalizers. The pressure in the backwash system is controlled automatically from the panel by an air-operated recorder controller. Other items which are recorded automatically are the backwash level, city water pressure and water storage tank level.

The instrumentation of the power house for the automatic boiler control includes temperature indicators and recorders, forced and induced draught indicators, steam pressure gauges and smoke density indicators. The turbine panel consists of temperature recorders and other automatic control apparatus for pass-out steam.

Most of the instruments on the site have been provided by Bristol's Instrument Co., Foxboro', Ltd., Honeywell Brown, Ltd., and Bailey, Ltd. The compressed air for the instrumentation system is provided by an Alley &

(1) Motors for solutizing solution charge pumps on the gasoline treating unit. (2) General view of the instrument panel in the water treating unit. (3) A view looking towards the inlet flow transmitter integrators

MacLellan compressor through an 11 kW Birlec drying unit.

Throughout the refinery there exists a comprehensive fire warning system of hooters. By means of code from the central telephone exchange the degree and position of the fire will be given to the fire-fighting personnel. For small and local outbreaks the fire warning system will be restricted to the area concerned and the area where fire-fighters are standing by. This is to ensure a minimum of interruption of refinery operation in other areas.

On all process units the electrical installation is designed to meet the flameproof requirements of the Ministry of Fuel and Power. For the flameproof lighting installation on the units, Simplex Electric Co., Walsall Conduits, and the General Electric Co. were the main suppliers, and the socket outlets are of A. Reyrolle & Co.'s manufacture. Within the safe areas such as control rooms, substations, water pump house and on the exterior of certain buildings lighting fittings of the Holophane type have been erected. For the off-site buildings and offices, mainly fluorescent fittings of S.L.R. manufacture have been installed, and for street lighting Concrete Utilities road lighting standards are fitted with S.L.R. lanterns. For the off-site facilities all socket outlets are of the 13 A ring main type, manufactured by Walsall Conduits, Ltd.

As in all refineries, a high proportion of the electrical equipment is for pumping crude oil, processed products or water, and for this purpose there are about 350 electric motors, mainly of the direct-on-line type, which range in size from ¼ to 650 h.p., the principal makes being English Electric, Crompton Parkinson, Bruce Peebles and Laurence, Scott.

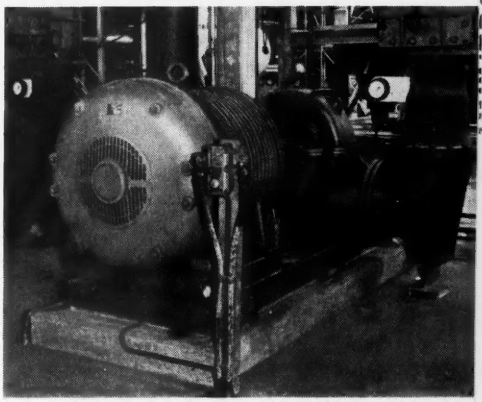
For the water intake two Gwynne pumps driven by 200 h.p. 3·3 kV Metrovick motors pump water at the rate of 5,500 gall/min each. These pumps are for providing water to the power plant condensers against a total head of 85ft. Two larger pumps of Gwynne manufacture pumping 12,500 gall/min, each driven by 650 h.p. 3·3 kV Metrovick motors, are employed for circulating cooling water to the various processing units, against a head of 120ft. For the condensate return one electrically driven 2-stage centrifugal pump (15 h.p. 440 r.p.m.) and one steam turbine driven single-stage unit have been provided.

Motor starters of the non-flameproof type are installed in pressurized switchrooms and substations, and operating push-buttons are fitted on the units adjacent to the motors. The switchgear and motor starters within the substations or switchrooms were provided by the Yorkshire Switchgear Co., Ltd., and M. & C. Switchgear, Ltd.

There are nine substations placed strategically on the site, each of which has a dual feed of 11 kV and in most cases duplicate transformers. The transformers are principally of 750 kVA rating but several are of 1,000 kVA. With the exception of large motors which will operate on 3·3 kV, the main distribution system will be 415 V three-phase 50 c/s a.c., the transformers being manufactured and supplied by the British Electric Transformer Co., Ltd.

The generating plant comprises three 5,000 kW Metrovick alternators with directly coupled 41·5 kW 180 V exciters. The sets generate at 11 kV three-phase 50 c/s at a power factor of 0·8. The prime movers, which are double pass-out type steam turbines, receive steam at 735 deg F and at a pressure of 600 lb/sq in. After the first pass-out the steam is at 470 deg F and 125 lb/sq in and after the second pass-out the steam is at 270 deg F and 20 lb/sq in. The system is extremely flexible in its operation. With a maximum load of 5,000 kW and without any pass-out steam each set absorbs 57,800 lb/hour of steam. With a load of 4,000 kW the set will absorb

100 h.p. motor driving atmospheric overhead pump on distillation unit



44,000 lb/hour of steam. About 5,500 gall/min of cooling water passes through the condenser at a temperature of 65 deg F. An air ejector operated on the 600 lb/sq in steam line is capable of dealing with 27 lb of uncondensed gases in an hour. The oil which is used to lubricate the turbines is purified by means of a De Laval plant and is indirectly heated by an 18 kW 415 V unit of Heatrae manufacture.

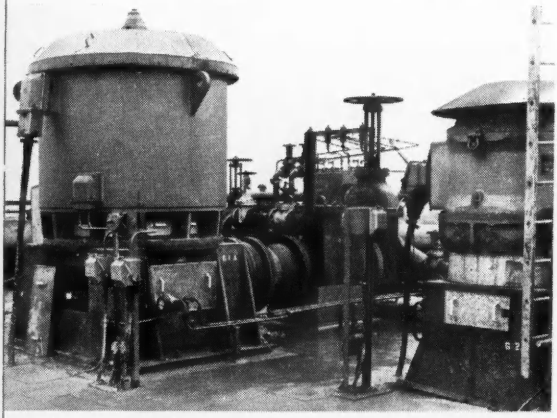
For maintenance and also construction, the turbine house is provided with a 20 ton Carruthers travelling crane. To provide steam for the turbo-alternators, process plant and heating, etc., there are three International Combustion vertical tube boilers each of which will give an output of 180,000 lb/hour at 650 lb/sq in and a temperature of 750 deg F. The power plant has been so designed that the south end of the building may be removed to provide facilities for an additional one to three units of boilers and generator sets.

The fuel used for normal firing will be propane tar but provision has been made so that kerosene, fuel oil or refinery gas may be used. The fuel oil is pumped from the storage tanks by alternatively steam turbine or electrically driven pumps. Where necessary, this fuel oil can be passed through a filtering plant before being injected into the boilers. The fuel is pre-heated to a temperature of about 400 deg F by means of thermostatically controlled steam coils. Fuel is injected into the boilers with atomizing steam at a pressure of 150 lb/sq in. The turbine-operated pumps are driven by steam at 600 lb/sq in, and the pass-out steam of 20 lb/sq in is then fed back into the low pressure steam main. An induced draught fan of James Howden manufacture will normally be coupled through gearing to a 615 h.p. steam turbine which will provide a final fan speed of 1,020 r.p.m. Temporarily, this fan will be running at half normal speed and will be driven by a 100 h.p. 415 V English Electric motor. The forced draught fan, which is driven by a 350 h.p. steam turbine geared down from 7,150 r.p.m., is arranged for air recirculation to prevent condensation in the ducting.

Both the feed water and the air to the boilers are pre-heated. The Howden-Ljungstrom air pre-heater is normally driven through worm gears at a speed of 3 r.p.m. by means of a 3 h.p. electric motor, but should this fail it is possible to operate the unit from the compressed air system at a speed of 1 r.p.m. For the bearings, an oil pump has been provided. In addition to the main steam-turbine driven boiler feed pumps providing 800 gall/min, there is an auxiliary boiler feed pump of the three-throw type operated by a 75 h.p. English Electric motor. As a stand-by house set a 10 kW 415 V/240 V turbo-alternator has been supplied by Hayward-Tyler & Co., Ltd.

The main control room of the power plant has been designed for a total of six generating sets; the panels for the three future alternators have been blanked off. The general colour scheme is an attractive two-tone green. In addition to being pressurized, the building is completely soundproof

Cooling water pump driven by 650 h.p. motor on left and one driven by 200 h.p. motor on right



A section of the water treating pipelines taken from the end of the gangway between the six zeolite softeners

and air conditioned. The air conditioning scheme will provide clean, temperature-adjusted air to suit seasonal conditions. The main circuit breakers are of the Reyrolle C7T 250 MVA 11 kV horizontal draw out compound-filled oil type.

The Lummus Co. have acted as consultants and general contractors for the complete refinery with John Laing & Son, Ltd., Richard Costain, Ltd., and Sir Robert McAlpine & Sons, Ltd., as the principal civil and constructional sub-contractors. The electrical installation work was carried out by Electrical Installations, Ltd.

As may be judged from the details given above, the contribution of British contractors and manufacturers to this great new Anglo-American enterprise is particularly large. Indeed, it is anticipated that over 95 per cent of the equipment used in the finished refinery will be of British manufacture.

Engineering in Europe

Survey of Current Literature

CORRECT evaluation of surge phenomena in transformers is mainly a matter of properly estimating the magnetic and electrostatic linkages in the rather complex arrangement of an actual transformer, and also a question of the theoretical method used. Thus, even assuming, with the majority of workers, that in the main electromagnetic mutual inductance determines the character of the transient phenomena in the winding, great differences between the results of calculations based on total flux and those based on mutual inductance of two turns, without considering the rest of the winding, are unavoidable. The first of these authors therefore suggested in 1944 and 1946 an analytical method based on a " mutual inductance function " combining electrostatic and electromagnetic linkages, i.e., a relation between the mutual inductance of two elements of the winding and their mutual distance.

The experimental complement of this theory is now supplied in the form of measurements of the electrostatic and electromagnetic mutual inductances as functions of turn spacings of the secondary winding of a model transformer. The periods of the natural oscillations of the winding for steady sinusoidal oscillations are determined and the surge voltages in impulse conditions are measured. The results are compared with the author's theory. The investigations are confined to the case of practical importance that the secondary winding is short-circuited and the neutral of the primary winding earthed. The measurements were carried out at frequencies of from 50 c/s to 200 kc/s. The agreement with the theory was satisfactory. —" Calculation of Voltage Surges in Transformer Windings," V. A. Karasev and A. V. Sklyanin, *Elektrichestvo*, No. 11, pp. 46–50, 1952, in Russian.

Surge Protection

Limited protection of power stations and substations against atmospheric surges (lightning) is obtainable by lead-in cables, if the incoming overhead line is supported on steel pylons and if the cabled section is comparatively long. However, the protective effect is confined to chopped surge waves due to strokes impinging on the station. Strokes to the last span of the overhead line leading to the cable end tower may endanger the cable as well as the station unless additional protection is provided; nor may a cable lead-in be regarded as an effective protective device against surge waves arriving from an overhead line on wooden poles, because the very high impulse breakdown strength of wood would allow travelling waves of great length and high amplitudes to reach the station.

A relative measure of safety can be achieved only by providing surge divertors, if possible, some distance in front of the cable end tower, because the divertor responds only with a certain delay caused

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. —Editors, *Electrical Review*.

by wave reflections in the cable, so that a divertor on the cable end tower could not "catch" the first wave train arriving. In addition, the divertor must be far enough from the cable end tower to ensure that the wave reflected at the latter does not arrive too soon after the direct wave. Even then a divertor cannot protect terminal and through stations against strokes to the last span of the overhead line, least of all if the latter is on the wooden poles. In this case cable end tower and station each requires its own divertor protection.—"Surge Protection of Stations by Lead-in Cables and Surge Divertors," H. Marzal, *Elektrizitatswirtschaft*, Vol. 51, No. 22, pp. 608–613, November, 1952, in German.

Submarine Power Cables

The necessity to use spaced single-phase cables for submarine h.v. transmission over great distances, such as, for example, the English Channel, sets a novel thecretical problem. The spacings may vary between 100 and 1,000 m while the cables rest on the sea bottom which forms the surface of separation of two conducting media (sea water and ground below), the conductivities of which may be in a ratio varying between 100 and 100,000.

A main complication is that this system does not possess the symmetrical polyphase structure of the usual three-phase transmission systems, which excludes the use of the method of symmetrical components. On the other hand, the geometrical distance of the phase conductors being very large compared with the conductor diameter, the Kirchhoff equations may be written down phase by phase because the mutual inductances between the cores of any two cables are equal to those between the corresponding cable sheets, this being a simplification against the usual case.

Tabulation of the impedance coefficients shows that another kind of symmetry than that familiar from systems on land still exists. However, the Kirchhoff equations represent only the electromagnetic behaviour of the system, not the electrostatic one (the capacity currents), thus the two phenomena must be treated separately and the solutions superimposed. The author outlines the solution to be obtained by combining that of the internal problem of the cables (by Kirchhoff's equations) with that of the external problem found by integrating the Maxwell equations for the separating space, the vector potential forming the uniting principle.—"Power Transmission by Spaced Single-Phase Submarine Cables," M. G. Nasse, *Bull. Soc Franç. Elect.*, 7th series, Vol. 2, No. 24, pp. 699–705, December, 1952, in French.

Ionization in Transformers

The first part of this paper gives an account of a simple installation for ionization tests and valuable details about the characteristics of the brush discharges in gases, solids and liquids and heterogeneous systems with various electrode arrangements. The test arrangement for transformers is then described and the particular types of brush discharges obtained by its use analysed. They are composed of isolated aigrettes, or brushes, representing waves of very steep front and short tail, and repeated h.f. brushes. An analysis of the latter is conveniently based on h.f. equivalent circuits of star- and delta-connected transformer windings, which enables voltage distributions and movements of charges for ionization at an internal point of the winding, or near the neutral point, to be determined.

The second part gives details of the measuring method, the third the results of tests up to 35 kV rating of the transformers, elucidating particularly the role of the air inclusions in the oil and stating that the de-aeration of new transformers takes usually about one month, after which the ionization threshold is not only stabilized but generally improved. The French regulations on this characteristic are criticized, since they require a value of $1{\cdot}15\ U_1/\sqrt{3}$ (where U_1 is the rated insulation voltage) to be maintained during the voltage rise, whereas in the opinion of the authors the value during voltage decrease should be considered. The complementary character of insulation and ionization tests is stressed, as well as the importance of Schering bridge measurements as the only means of reliably assessing the risks of thermal breakdown of the solid insulation. Ionization tests, on the other hand, reveal the dielectric characteristics of series arrangements of heterogeneous insulators.—"Investigation of the Ionization Threshold in Transformers," R. Blanchardie and R. Aftalion, *Rev. Gen. Elect.*, Vol. 61, No. 11, pp. 485–497, November, 1952, in French.

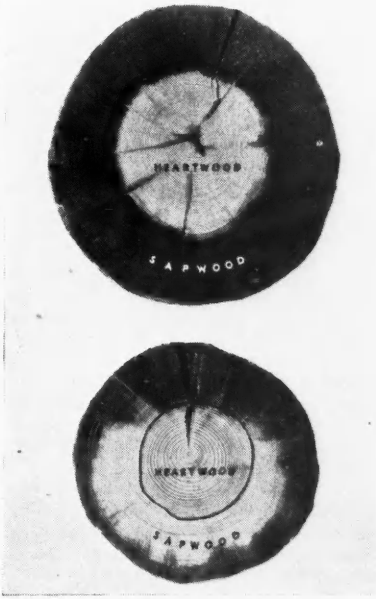
Preserving Wood Poles

*Outcome of an Experimental Investigation**

A LARGE number of creosoted redwood poles supporting overhead power lines have failed during the last few years through internal decay after only about 15 years' service, although their normal useful life should be from 40 to 80 years. The reason has invariably been that the poles had not been properly treated, for the outer band of perishable sapwood into which the creosote ought to have penetrated completely was found by examination to have been only partly penetrated, leaving uncreosoted zones inside which had begun to decay.

It is not difficult to completely creosote the sapwood band so long as it is not attempted while the pole is green, for then the appreciable water contained in the sapwood will, during treatment, be driven towards the inner part of the sapwood, thus keeping out the creosote so that infection will eventually find its way through splits in the sapwood and there set up decay.

To ensure that emphasis will in future be laid on the need for adequate seasoning and creosoting of poles the British Standards Institution has been recommended to revise B.S.139 and 513 which will be replaced by a new Standard so that the normal length of service can be expected of poles treated in compliance with the new specification.



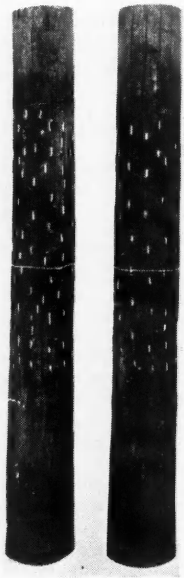
Typical cross sections of redwood poles, showing completely creosoted sapwood and (bottom) imperfect penetration into sapwood

The most widely used of the treatments that have been tried for retarding, or arresting, decay is the "Cobra" process, which consists of injecting a water-soluble preservative paste into the pole at intervals around its circumference by means of a special tool. The area treated usually extends from about 18in below to about 18in above the ground line. Wherever sufficient moisture is present the paste dissolves and diffuses from the tool incisions into the surrounding wood. In this way it is hoped to reach and kill any wood-rotting fungi there may be in that part of the pole and to preserve any uncreosoted sapwood which has not yet decayed.

The "Cobra" process was originally developed in Germany about 1920 and has been employed on the Continent mainly for the treatment of standing poles. It has been used both on newly erected poles and also on treated and untreated poles which have been in service some time and have started to decay. It is only during the past few years, however, that it has been used in this country for arresting internal decay in badly creosoted redwood poles.

* Based on Report O/T10, by D. N. Smith, of the Electrical Research Association, the investigation having been carried out at the Forest Products Research Laboratory with material supplied by the Merseyside and North Wales Electricity Board.

Information is not known to be available on the effectiveness of the process for dealing with this particular type of failure and some service trials have therefore been started to find out approximately what extra life can be obtained from defective poles by applying the "Cobra" treatment. A line of creosoted poles which had started to decay was divided into two groups which, so far as could be ascertained, were in the same average condition; one group was treated, the other being left as a control. It may, however, be some years before any results are obtained. Meanwhile some poles which had been treated by the "Cobra" process in 1947 have been examined for evidence of whether the preservative had diffused into the uncreosoted sapwood to a sufficient extent to render it more resistant to decay.



Two "Cobra" treated poles, showing ground line and tool incisions

Pieces cut from two poles at different levels between about 3ft below and 3ft above the ground line, with the position of the ground line and the incisions made by the "Cobra" tool marked, were cut into discs about 2in thick. One of the poles was almost completely penetrated by creosote, but the other had quite a large proportion of uncreosoted sapwood extending throughout the entire length and, from about the ground line upward, it had started to decay.

An attempt was first made to obtain some visual indication of the extent of diffusion of the preservative into the uncreosoted sapwood inside the pole. The preservative has not sufficient colour to show up by itself and its presence is usually detected by spraying the wood with a reagent,* which undergoes a marked change in colour when it comes into contact with the preservative. Several cross sections of the pole were treated with this reagent but in no case did it give a sufficiently positive reaction to justify drawing conclusions. Staining with another colour reagent also failed to give reliable results, so it was decided to make a direct test by examination.

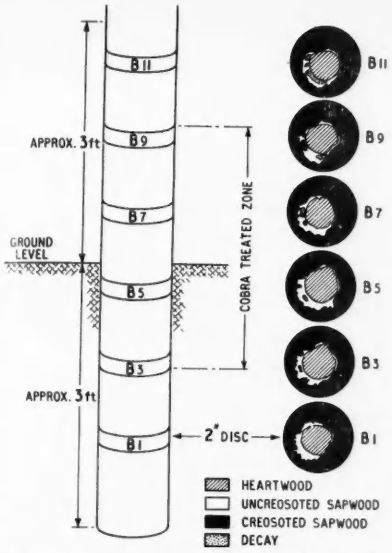
A group of small blocks was taken from each of the 2in discs previously mentioned so that the decay resistance of the imperfectly creosoted sapwood at different levels in the pole could be assessed. The 2 by ½ by ½in blocks were placed in flasks in close proximity to specific wood-rotting fungi growing on a nutrient medium and incubated for three months under conditions ideal for the development of decay. They were then removed and the amount of decay in each block was estimated visually and also by measuring the weight it had lost during the test. The average weight loss and condition of the six specimens taken from each disc are given in Table I.

Table I.—Test Results

Disc No.	Average loss in weight, per cent	Visual estimate of decay
B-11	31	Complete
B-9	14	Considerable
B-7	1	Negligible
B-5	0·5	Negligible
B-3	3	Very slight
B-1	6	Small

Under the conditions of this test, unpreserved sapwood from Baltic redwood poles decays very readily; some blocks lost 30 per cent of their weight and were completely decayed at the end of the test. Table I shows that the majority of the test blocks had not decayed to anything like this extent, indicating that the "Cobra" salts had diffused into the uncreosoted sapwood in the interior of the pole and protected it against decay. Diffusion occurred more readily in the part of the pole below the ground level, where the wood was much wetter. The salts had apparently diffused downward, as well as transversely, because the sapwood in disc B-1, situated well below the lower end of the "Cobra" treatment, had decayed much less than untreated material would have done.

* An acid solution of zirconium oxychloride and sodium alizarin sulphonate, commonly used for preservatives containing a fluoride.



Diagrammatic representation of amounts of imperfect creosoting and of decay at different pole levels (Table I)

In the drier part of the pole above the ground line, however, the salts did not appear to have diffused quite so well. Thus, the sapwood 8in above the ground (disc B-7) was protected, but 19in up where the "Cobra" treatment finished (B-9) it had decayed considerably and above that level (B-11) it had decayed completely.

The conclusions from examination of the pole are that "Cobra" preservative diffuses from the tool incisions where it is applied into the interior of the pole, increasing the decay resistance of any uncreosoted sapwood which may be present.

The preservative appears to travel downward beyond the lower limit of the treatment, towards the wetter part of the pole, but it does not diffuse upward above the top limit of the treatment where the wood is drier. This treatment can therefore be expected to arrest, or retard, internal decay within the region of the pole to which it is at present applied, but it is not likely to have much effect on decay occurring above that level.

Decay occurs at all levels and at present there is little evidence to indicate whether it is likely to occur more often at one level than at another. In untreated timbers decay nearly always occurs near the ground line where the wood is continually damp and well aerated. It does not necessarily follow, however, that it will do so in badly creosoted poles, because, in such poles, the incidence of decay will not depend primarily on where the optimum moisture content is, but on the position of the untreated sapwood and on whether it becomes exposed to infection by splits developing in service. Rain driving into splits will generally provide sufficient moisture to support decay, whatever the height. There are examples of decay well above the ground line.

It would appear that the value of the treatment does not extend above the area of the pole treated and that the position of the decay in defective poles will be the main factor in deciding whether or not it will be possible to extend the useful life of poles by remedial treatment of this type.

Light and Plant Growth

AT the recent annual general meeting of the Birmingham Centre of the Illuminating Engineering Society Professor R. H. Stoughton, D.Sc., delivered an informative paper on "The Effect of Light on the Growth and Development of Plants."

The subject discussed is by no means a new one, for its study, as was pointed out, had been pursued in varying degrees over the past century. The speaker made reference to germination, the rate of growth, photosynthesis and general development, explaining how some seeds required a great amount of light and others none at all. In this connection he demonstrated that the rate of growth of a plant was reduced by light in proportion to its intensity. The Professor also explained how a decrease or increase of light on a plant determined direction, quality and quantity.

It would appear that plants are widely grouped under three particular types: Those which benefit by a short day or a long night; those which develop in long days only; and those which appear to grow equally well under any average light condition, whatever its quality or quantity.

Professor Stoughton gave ready answers to many questions and was accorded a vote of thanks on the proposition of Mr. J. Ashmore, seconded by Mr. J. Beresford-Horniblow.

Overhead Distribution Scheme

Economics of an All-Aluminium Low Voltage Network in Essex

By A. E. SOMERS, A.M.I.E.E.

ALTHOUGH steel-cored aluminium conductors are already widely used for overhead lines, plain stranded aluminium conductors for low voltage overhead networks are not yet common in Great Britain. Therefore a few notes on an aluminium low voltage distribution scheme erected a year ago in an Essex village by the Eastern Electricity Board may perhaps stimulate thought on the economics of this method of distribution.

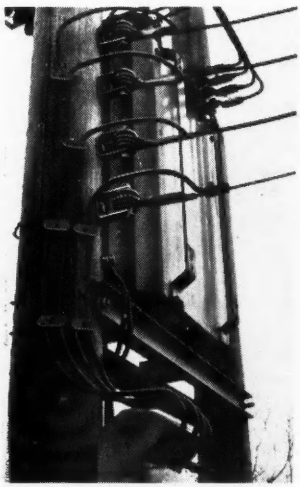
The consideration that prompted the use of aluminium for the scheme was, of course, the prevailing one of economy in capital expenditure. It was considered that a reduction in the capital cost of the order of 30 per cent on the total cost of the mains could be made by substituting aluminium for copper and this figure was, in fact, achieved on this particular scheme.

Initial Considerations

The first problem to be considered was the very important one of electrolytic action at bimetal connections, which is one that looms largely in many engineers' minds. In this case the only bimetal connection on the actual overhead line was to be made at a transformer, and it was accordingly decided to use a standard type of bimetal lug as described later in this article.

The next matter was to consider the method of service connections; it was decided to use an aluminium service line terminating in the service cut-out, so that a bimetallic connection would also be made in the service cut-out. Electrolytic action does not take place between two dissimilar metals unless moisture is present at the junction; thus, by making the connection inside the building, where it is normally dry, the possibility of electrolytic action is minimized. The additional precaution was taken of coating thoroughly the aluminium conductor and the inside of the terminal block with a high melting point graphite grease, in an endeavour to obtain protection against any possible penetration of moisture. Time alone will tell whether there are any drawbacks to this idea, but it is known that there are instances of such connections, even without the grease protection, being in perfect condition after thirty years of service.

A comparison of sag charts between a 0·06 sq in copper conductor and 0·06 sq in copper equivalent aluminium conductor showed that the sags were approximately the same when erected to allow the maximum tension under worst conditions of 1,000 lb. In fact, under normal working conditions, the sag of the aluminium conductor is less. It was obvious, therefore,



"H" pole showing bimetal lugs used on transformer medium voltage terminals

that standard copper erection practice could be generally adopted.

Pole Sizes

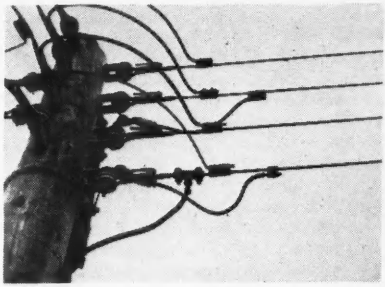
The method of constructing the line was, generally speaking, the same as would be used for a copper line, the span length being of the order of 50 yards according to the disposition of the services, angles, etc. At angle and terminal poles the stays were the same as for a copper line, but, as the everyday working tension is less, there will normally be less loading on the stays and their anchors.

The specific resistance of aluminium is 1·6 times that of copper and the increase in cross section of the aluminium conductor over its copper equivalent is similarly proportional.

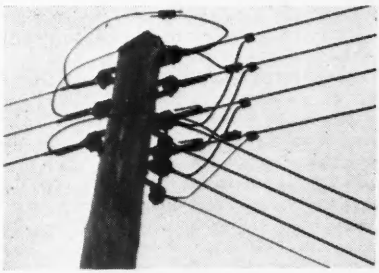
This fact raises the matter of wind and ice loadings on the lines, but it was found by calculation that the increase in pole size required was negligible. For example, considering a 28ft by 7½in straight line pole, the increase in pole diameter necessitated by the use of 0·06 sq in copper equivalent aluminium conductor was found to be only ⅛in and, as it is general practice to utilize poles of rather larger sizes than the calculated ones for normal low voltage distribution, it appears to be reasonable to neglect this factor and use the same size of poles as for a copper line of the same equivalent cross section.

Conductor Erection

The erection of the conductors is considerably easier than with copper; two men can comfortably pull up four spans of 0·06 sq in copper equivalent aluminium, a useful consideration where a small gang is employed. As with other conductors, care is necessary, of course, when running the conductor out to avoid damage by dragging it over abrasive road surfaces, brick walls, etc. With reasonable care, however, there is hardly any more chance of damage with aluminium than with other conductors, and the low weight of the conductor reduces the risk of serious abrasion. Here again, in the initial manhandling of the drums of conductor, the work is made very much easier by the great reduction in weight of the drum. On this particular job, ordinary draw vices were used and the conductor did not appear to suffer any damage, probably because of the low stringing tension since the conductor was not prestressed, but pulled up to the appropriate sag.



First pole of medium voltage line showing special "T"-type bimetal connection for coupling copper earth wire to aluminium neutral conductor. At the back of this pole is a tier-type box with bimetal lugs for connecting the aluminium lines to the pole box connections



Four wire to three wire section pole with four wire service

At all insulator points the conductor is bound with a length of soft aluminium tape before the aluminium binding wire is applied, to avoid possible chafing by the binder or any tendency of the conductor to "birdcage." Connections on bows are made with a parallel groove aluminium alloy connector, well greased with a high melting point graphite grease before use. The conductor should be properly cleaned before the fitting is fixed.

Pole Transformer Connections

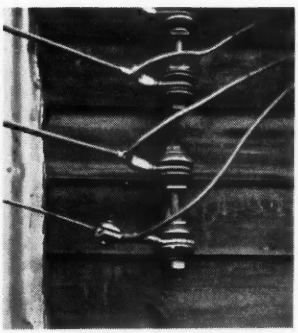
At the pole transformer, bimetallic cable lugs were used on the low voltage side. These lugs have a moisture resisting washer separating the outer surfaces of the two dissimilar metals, and after the aluminium conductor has been inserted and tightened up the interior of the lug is filled with

grease by means of a grease gun through a special filler hole. For earthing the transformer tank and ironwork on the "H" pole, a normal earth electrode and mat are employed with a copper conductor used for the earth wire. The transformer neutral earth is obtained in the normal manner, one span out from the "H" pole, but not using an aluminium conductor for the earth lead because of the difficulties in overcoming any possibility of corrosion at the junction of the earth electrode system. A copper conductor is used with a bimetallic line tap which is bolted on to the main neutral conductor of the system.

The cost of aluminium h.s.o.s. (house service overhead service) or aluminium p.b.j. cable is about the same as that of the equivalent size of copper cable, although prices are tending to fluctuate from day to day.

The advantage, therefore, of substituting insulated aluminium service cables in place of copper service cables is purely a technical one as previously indicated, although, of course, an appreciable saving is made by using a bare aluminium conductor for the neutral line in place of copper.

There is, however, another type of insulated cable which demands consideration, the p.v.c. insulated type. When the work described was carried out the costs of p.v.c. and p.b.j. finishes were approximately the same and it was considered that a saving could be made by the use of p.v.c. as it would be possible to continue the same kind of cable as that used for the aerial span right into the cut-out position instead of changing from p.b.j. to h.s.o.s. at the termination of the aerial span. This form of insulation is widely used in America for aerial spans and as the ultra-violet content of light in this country presumably does not exceed that in America it appears reasonable to anticipate satisfactory service from p.v.c. used here. Consequently an experimental p.v.c. service was installed.



Service termination in h.s.o.s. cable illustrating method of binding bare neutral with aluminium tape to prevent possibility of "birdcaging" and use of aluminium wire to bind in h.s.o.s. conductor

Conclusions

From the lessons learnt on this experimental network one can say that a definite overall reduction in cost can be achieved by the use of aluminium conductor for low voltage overhead distribution. Rather more care is needed on the part of the linesman than when handling copper and, quite naturally, when working with a new material requiring a different technique, a longer time is taken initially over any one particular operation. When "binding in," for instance, the application of the aluminium tape to the conductor before carrying out the binding adds to the time taken, but it is felt that once working with aluminium is established these slight differences in time will rapidly disappear and be outweighed by the ease of handling the much lighter conductor. A very careful check is kept on this line by means of inspections carried out at regular intervals, with special reference to all joints, in order to ascertain that electrolytic action is not taking place and it is hoped that some useful information will be obtained in due course.

The writer thanks the Eastern Electricity Board for permission to publish these notes.

Yukon Survey

A CANADIAN company has been given Federal permission to make water power surveys in the Yukon with a view to establishing a large hydro-electric development on the Yukon–British Columbia border. The potential resources are believed to be in the region of 5 million h.p. At the same time the Canadian Government has rejected a proposal by the Aluminum Company of America to use the waters of the Yukon River to provide power for a $400 million smelting plant which the company planned to construct in Alaska. The Yukon River cuts through Alaska, but has its headwaters in the Yukon territory and Northern British Columbia.

After Five Years

How Electricity Supply Nationalization has Affected Employees

By W. WALSH, A.C.I.S.

ANY comparison between 1948, when the electricity supply industry was nationalized, and the present day must be coloured by the success or otherwise of one's own ambitions, must be supported by reference to standards of living then and now, and must be conditioned by the section of the industry in which one is employed.

It is true to say that the manual workers are better off in real terms as well as purely money terms, but that is equally true of similar workers in hundreds of other trades. Where they are not so well off is in the opportunities afforded to them for promotion and progression. The inevitable consequence of amalgamation, of creating larger units, has been economy in the use of supervisory staffs, foremen and charge hands. The centralization of stores and meter reading has reduced the necessity for men in these employments and in only the last twelve months the return of more competitive conditions has tended to accelerate this trend.

This same process has affected engineers, and clerical and administrative workers too. Although only in the minority of cases have definite establishments been laid down for various sections or units within the engineering and administrative framework, vaguely possible establishments appear to have made management cautious in creating graded posts.

Moreover, the pronounced attempts to achieve a measure of uniformity within the organization, based on what is considered to be the most efficient and economical, plus the assimilation of forms and systems, has tended to create a comparatively few specialist posts and to leave a greater mass of employees in the lower graded positions.

On the clerical and administrative side all this has removed the opportunities for promotion both within an Electricity Area and within the units (Sub-Area and District) of that Area and reference to the "Situations Vacant" pages of the *Electrical Review* for the last twelve months shows the effect nationally. Salaries have risen but no more than comparative salaries in other occupations. Engineers have not been affected to quite the same extent, however. Their scarcity has tended to keep the demand for them fairly fluid and while they may have suffered some loss of opportunity, the very cause of this (i.e., amalgamations) has tended to raise their salary levels, since the "unit" in which they were has tended to come into the higher classifications in a series of salary scales based on units sold.

Improved Conditions

But salaries, wages and opportunities are not the whole story. In the field of welfare there has been a great levelling up. Conditions of employment have improved very markedly in some instances and facilities for communal relaxation have been extended to many thousands who before 1948 neither had the facilities nor were likely to have them. Educational and training opportunities are extended to the many rather than the few and while the number of rewards to the successful are fewer it may be more worth while striving for them.

Labour relations have altered since the early days of nationalization, but it is difficult to say that they are better now than they were before. On the one hand we have the network of various Staff, Works and Local Advisory Committees where men and managers sit together; on the other the intimate and almost personal relationship between the individual employee and his "chief" which did exist has

now very largely disappeared. Whether the new relationship is better than the old is a question for debate. Where, however, before nationalization the undertaking was reasonably compact, there is no doubt that employees feel that the relationship is not so good.

This reveals a very definite loss that all employees have sustained. Nationally negotiated agreements under which (with a minor exception) all work, while equating conditions of employment and rates of pay throughout the country also act as a clog on enterprise. Whereas before 1948 exceptional ability and merit could be and were rewarded now it is in practice almost impossible to secure such recognition simply because it creates undesirable " precedents."

Finally, many employees are very intimately concerned in the " consumer to industry " relationship and this shows no improvement over that existing before nationalization. The " Board " has been so often misrepresented as the new bureaucracy and its employees as a new race of civil servants without adequate reply that those employees in touch with the public tend to become weary of the petty pinpricks which can be inflicted on them. Resentment is engendered by instructions which do not permit of compromise and by the very often ill-concealed antipathy of the public to dealing with a soulless " Board " irrespective of the humanity of the person who represents the " Board."

A fair summary would be that employees have lost a little and gained a little from nationalization. Some are better off and some worse off than they *might* have been, but in general the majority *feel* that they are worse off, but not so much worse off as in any way to affect their loyalty to the industry which provides their bread and butter, and occasionally a little jam.

Transformer-Analogue Network Analysers

THE solution of all but the simplest electric circuit problems by the use of a slide rule is familiar to most engineers as a lengthy and tedious process. Such difficulties have led to the use of various aids to solution, of which the most widely used have hitherto been model networks. Most of these network analysers have consisted of variable resistors, inductors and capacitors which can be adjusted to represent a particular network.

In a paper which was presented at a Supply Section meeting of the Institution of Electrical Engineers in London on 25th March by Mr. M. W. Humphrey Davies and Dr. G. R. Slemon (both of Imperial College, University of London) an analyser is described which is intended for the study of a.c. networks in the steady state and for the solution of linear simultaneous equations with complex coefficients. " Ideal " voltage transformers are used to represent the impedances of the resistors, inductors and capacitors of the network. Essentially the analyser consists of a measuring section and a number of identical panels each containing two multiplying units, the latter of course being voltage transformers.

For many problems the analyser has distinct advantages over the conventional instrument using variable-impedance elements. Negative resistors, resistance-free inductors and current sources can be represented without difficulty by single universal units of the analyser, while two units coupled together serve to represent mutual inductors, network transformers and other coupling effects.

When the analyser is in use there are four separate networks and the voltages in these correspond to the in-phase and quadrature components of the voltages and also of the currents in the network under investigation. This makes it possible to apply various special restraints which are not possible with a model network; for example, those required to represent a salient-pole synchronous machine by the two-reaction method. The accuracy of the analyser depends upon the suppression of amplitude and phase errors in the voltage ratios of the transformers, and each transformer is furnished with the required exciting current from special compensators. The paper concludes with examples of the principles to be adopted in applying the analyser to common problems concerning the behaviour of power networks, electrical machines and closed-loop control systems as well as to the solution of linear simultaneous equations.

VIEWS on the NEWS

By REFLECTOR

SEVERAL of my neighbours have been persuaded by specious propaganda to install "improved" solid-fuel burning appliances. Most of them confess that their fuel consumption remains much as it was before, although one asserts that his bill has been doubled. All, however, complain of the smoke and soot engendered because smokeless fuel is unobtainable; and a local chimney sweep says that the appliances have been a boon to his profession. How much better it is to burn "nutty slack" in power station furnaces than on the domestic hearth.

* * *

The Electrical Engineers' Exhibition at Earls Court had a good "press," including a notice in the *Nottingham Guardian* to the effect that it was "designed mainly to reduce the household electricity bill." The organizers may have had this point in mind but "mainly" is a bit strong.

* * *

Those unaccustomed to Indian numerical notation are always uncertain how much a crore is and how much a lakh. The first is 10 million and the latter 100,000. Usually the terms are used for currency (rupees) but they are also generally applicable. All the same I think it strange that the compiler of a report on India, referring to the Indian electric motor industry, should say that: "To-day some eleven units are operating with an installed capacity of 1·5 lakhs h.p." As the report is intended principally for people in this country "150,000 h.p." would have been more comprehensible.

* * *

A heading in the Bradford *Telegraph and Argus*—"Electricity for Flappit Springs"—naturally made me wonder (before reading the rest) what sort of mechanical contrivances these were. Disappointingly, Flappit Springs turned out to be a district of Cullingworth, Bradford.

* * *

The *Daily Dispatch* (Manchester) publishes a report of a model rural electrification scheme to be carried out at Gornja-Jasenica, Yugoslavia. An idyllic account is given of what this rural community will look like when the work is carried out. Among other things, it is said that

> "villagers who to-day have never even seen an electric light bulb will, in a few months' time, be using electric washing machines, irons, cookers, refrigerators."

Presumably they will get all this equipment free; I cannot think that the average Yugoslav peasant's earnings could be stretched so far.

* * *

It gladdens my heart to see that the home of the Institution of Electrical Engineers on the Victoria Embankment is having a Coronation spring cleaning. The building is dwarfed by its neighbours on both sides, but after its renovation it will assert itself. It might have been thought that the Institution was built in dull red brick and dark grey stone but it is now revealed in its true colours—a cheerful red and white.

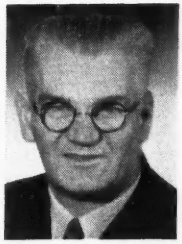
LONDON BOARD'S REORGANIZATION

CONSEQUENT upon the decision of the London Electricity Board to abolish the Sub-Area formation in its South Western Sub-Area (which has been divided into two large districts—see *Electrical Review*, 30th January, p. 235), the manager of that Sub-Area, **Mr. C. W. Blake,** has been appointed manager of the Western Sub-Area. The present manager of the latter, **Mr. L. H. Welch,** B.Sc.(Eng.), M.I.E.E., moves to the Northern Sub-Area as manager, and **Mr. G. J. Moody,** M.I.E.E., manager of the Northern Sub-Area, becomes manager of the North Eastern Sub-Area in the place of **Mr. J. W. J. Townley,** C.B.E., M.I.E.E., who is retiring.

Mr. Townley took over the N.E. Sub-Area upon nationalization having then been borough electrical engineer of West Ham since 1930. He was born at Paisley in 1885 and was educated at the local Technical College and the Manchester School of Technology. After holding positions with the Paisley, Trafford, Ashton-under-Lyne, Manchester and Sunderland electricity undertakings, he was acting electrical engineer at Barnsley from 1905 to 1918. He became chief assistant engineer at Sunderland in 1918 and deputy city electrical engineer of Bradford in 1922. Then he was appointed chief electrical engineer of the L.C.C. Tramways, leaving that post to become engineer and manager at West Ham in 1930. Mr. Townley was made a C.B.E. in 1946.

The retirement is also announced of **Mr. Robert Lee,** M.B.E., A.M.I.Mech.E., M.I.E.E., Sub-Area liaison officer of the London Electricity Board. Mr. Lee, who was born at Haslingden, Lancs, in 1885, was educated at the Blackburn Technical School and the Manchester School of Technology and received his training in the Darwen and Stockport Electricity Departments. He was appointed deputy borough electrical engineer of Stockport in 1920. He left there in 1928 to become borough electrical engineer of St. Helens but returned as " chief " to Stockport in the following year. In 1931 he became borough electrical engineer of St. Pancras, London, a post which he held until vesting day when he was made Sub-Area liaison officer. Mr. Lee is a past-chairman of the Council of the British Electrical and Allied Industries Research Association and is still a member of the Council.

Mr. C. W. Blake



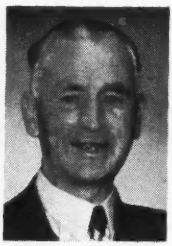
Mr. L. H. Welch

Another retirement is that of **Mr. H. C. Wells,** M.I.E.E., technical adviser to the Board's chief engineer (Mr. D. B. Irving). Until nationalization Mr. Wells had spent most of his career with the County of London Electric Supply Co., which he joined in 1908. He was successively transmission superintendent, assistant mains engineer, chief mains engineer and, from 1945 to 1948, technical adviser (transmission and distribution) to the County of London Co. and its associated concerns. On vesting day he was appointed deputy chief engineer to the London Board and took up the position from which he is now retiring in 1949. Mr. Wells is a member of the Société des Ingénieurs Civils de France.

After the ordinary monthly meeting of the London Electricity Board on 25th March, a luncheon was held at the Abercorn Rooms, during the course of which the chairman, Mr. H. J. Randall, C.B.E., presented long service awards to Messrs. Townley (gold watch), Lee (gold wrist watch) and Wells (chiming clock). The chairman expressed his appreciation of the valuable services they had rendered to the Board, and extended his good wishes to them in their retirement.

Mr. J. W. J. Townley

Mr. R. Lee



Mr. H. C. Wells

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced that **Mr. F. R. Moberly,** A.C.A., has resigned his directorship of Richardsons, Westgarth & Co., Ltd., and has also relinquished the appointment of secretary. He has been succeeded as secretary by **Mr. J. M. Ireland,** C.A. New appointments to the board of Richardsons, Westgarth (Hartlepool), Ltd., are **Messrs. H. Fothergill, T. B. Hall, J. Liddell, J. E. Smith** and **B. B. Wyatt.**

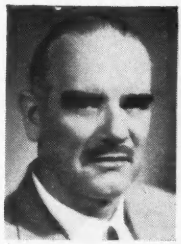
Mr. W. C. Bowler, M.I.E.E., retired from the Midlands Electricity Board at the end of March, where, since nationalization, he had held the appointment of manager of the Severn Vale District. Before nationalization, Mr. Bowler was for over twenty years electrical engineer and manager to the Warmley Rural District Council. He was also responsible for the design and carrying out of the electricity undertakings at Budleigh Salterton, Bridport and West Bay, while he was with the late Mr. T. Hood, consulting engineer, Bristol. Mr. Bowler is a member of the Bristol Electric Club, of which he was chairman for many years. He will continue to take an interest in local firms, having become chairman of J. B. Bowler & Sons, Ltd., engineers and mineral water manufacturers, Bath, and a director of the Bath Hygienic Laundry Co., Ltd. The Board has appointed **Mr. F. Freeling,** A.M.I.E.E., as his successor.

Mr. N. F. Palmer, general manager of Electrical Equipment of Australia, Ltd., Sydney, will arrive in Great Britain towards the end of June to visit the principals represented by that organization. His company represents many well-known English organizations for Australia and also owns B. & S. Electrical Pty., Ltd., and Acelec Pty., Ltd., manufacturers of indoor and outdoor switchgear. British electrical concerns who desire to obtain representation throughout Australia in either the domestic or engineering field can get into touch with Mr. Palmer, c/o the Commercial Banking Co. of Sydney, Ltd., Birchin Lane, London.

Mr. Alfred Blount, for the last seven years general manager of Vandervell Products, Ltd., has been appointed a member of the executive board of the Plessey Co., Ltd. **Mr. R. I. Hughes,** A.C.I.S., has resigned his appointment as managing director of the Ford Motor Co. of India to join the administrative establishment of the Plessey Co.

Mr. J. Brimelow has been appointed manager of the Blackpool branch of Hirst, Ibbetson & Taylor, Ltd., in succession to **Mr. W. A. Mackenzie** who is retiring after twenty-one years' service. Mr. Brimelow has been with the company ever since he left school, and for twenty-one years has been one of its representatives.

Mr. F. P. Egerton, C.B.E., M.I.E.E., the first general manager and deputy chairman of the Central Electricity Board of the Federation of Malaya, retired at the end of March. Mr. Egerton arrived in Malaya in September, 1926, and was appointed assistant electrical engineer, Seremban, Negri Sembilan, in the former Government Department of Electricity. He was appointed Director of Electricity to the Government of Malaya in 1946, after the liberation of Malaya. He was awarded the C.B.E. in the New Year Honours for his services in the transfer of the Government Electricity Department to the Central Electricity Board. Mr. Egerton has been responsible for the promotion of electricity supply in Malaya, including the bringing into operation of the Connaught Bridge power station, near Kuala Lumpur, which was recently officially opened by the High Commissioner of the Federation of Malaya and is described in this issue. Mr. Egerton is returning to the United Kingdom.



Mr. F. P. Egerton

W. T. Henley's Telegraph Works Co., Ltd., announce that **Sir John Dalton** joined their board on 31st March, and has become chairman of the company in succession to **Sir Montague Hughman,** who is remaining on the board. The preliminary announcement of this change in chairmanship was made in November last, and followed Sir Montague's decision to retire, which he announced at the annual general meeting of the company in May. Sir John Dalton had been director of the Cable Makers' Association since 1948. Upon leaving

the C.M A. Sir John was presented by the staff with a silver cigarette box as a token of their deep regard and appreciation. The presentation was made by Mr. F. Gentle, oldest member of the C.M.A. staff.

Mr. E. W. Wale, secretary of the Cable Makers' Association, after six months in the Edgware General Hospital in consequence of injuries received in the Harrow railway accident, has returned to duty. He will still attend hospital for treatment.

Mr. Frank Foster, M.Sc., A.M.I.E.E., has been appointed general manager of Crompton Parkinson's "Cyc-Arc" Stud Welding Division. After graduating at Leeds University, Mr. Foster joined F. & A. Parkinson, Ltd., and served for a number of years on the sales engineering staff. Following a varied experience in light and heavy electrical engineering in this country and the Far East, Mr. Foster joined the General Sales Department of Crompton Parkinson. Ltd., in 1937. He was associated with the expansion of the company's interest in the field of fractional h.p. motors until he entered the Overseas Division in 1948 to manage the export of plant products.

Mr. F. Foster

Mr. R. O. Herford, O.B.E., for many years managing director of the Renold & Coventry Chain Co., Ltd., has retired from that office but retains his seat on the board. During the last war Mr. Herford was "lent" by the company to the Ministry of Supply as Controller of Inspection (Administration). It was in respect of these services that in 1945 he received the O.B.E. Among other interests Mr. Herford has been a member of the North West Regional Council and the Overseas Trade Policy Committee of the F.B.I.

Mr. O. Bertoya has been appointed managing director in succession to Mr. Herford, and **Mr. W. S. C. Tully,** C.B.E., has been appointed deputy managing director, **Mr. W. V. Foley** being appointed general sales manager in succession to Mr. Bertoya.

Power station engineers in Kent gathered at the Royal Star Hotel, Maidstone, on 20th March, with guests, members of associated industries and businesses, and their ladies, for the annual dinner and dance of the Kent Section of the **Electrical Power Engineers' Association.** The guests were received by the chairman of the Kent Section, Mr. A. G. Salter, and Mrs. Salter. The toast to the Association was proposed by Mr. W. E. Gibbs, engineer-in-chief, South Eastern Electricity Board, who observed that nationalization had put greater responsibility on the Association. For the first time it became responsible for conditions relating to the technical staff all over the country. He thought everyone would wish to see engineers take over the management role in the industry, but the industry was getting short of good engineers.

Mr. J. Jones, National President of the Association, in reply, said that the Association did not advertise its activities sufficiently. A welcome was extended to Mr. Parr Norley (vice-president of the Association and chairman of the South East Divisional Council), Mr. H. Norton (general secretary), Mr. H. O. Mayfield (deputy general secretary), Mr. T. W. Lukehurst (area secretary) and Mr. H. F. Knell (Kent manager of the South Eastern Electricity Board).

Mr. B. H. Mears, director of Associated British Oil Engines (Export), Ltd., and National Oil Engines (Export), Ltd., has been appointed sales director of Mirrlees, Bickerton & Day, Ltd., a member of the Brush Aboe group.

In our issue of 20th March we reported the recovery from illness of **Mr. B. M. Weill.** Unfortunately, however, the name of the company, for which Mr. Weill is agent, was incorrectly given. It should have been Lewden Metal Products, Ltd.

Mr. Frank Dewhurst, A.M.I.E.E., A.M.I.Mech.E., deputy superintendent at Stuart Street power station, Manchester, since January, 1952, has been appointed superintendent of the new Chadderton (near Oldham) power station. Mr. Dewhurst served with the former Lancashire Electric Power Co. He was at Kearsley from 1945 to 1951.

Mr. F. Dewhurst

Speaking at the recent annual dinner of the South Western Sub-Centre of the **Institution of Electrical Engineers** at Plymouth, Mr. J. Eccles, a vice-president of the Institution, said that unless this country could produce goods and services at a price and on a delivery schedule that was at least equal to those of its competitors it could not maintain even the present standard of living. The natural resources of the earth were being consumed at a much higher rate than they were being produced, and natural alternative resources would have to be discovered and developed. Such was the task of the engineers and physicists of successive generations. It was a great challenge to knowledge, thought and experience, and he hoped they would not be

found wanting. Speeches were also made by the Lord Mayor of Plymouth, Alderman H. E. Wright; Mr. G. Monk, head of the Electrical Department of Plymouth Technical College; Mr. A. C. Warren; Mr. G. T. Garwood and the Sub-Centre chairman, Mr. R. H. Cotton, who presided. The toastmaster was Mr. N. Axford, Plymouth district manager of the South Western Electricity Board.

The Minister of Fuel and Power has reappointed the following as part-time members of Electricity Boards:—**South Eastern:** Ald. E. Simms, Viscount Falmouth, Companion I.E.E., M.I.Mech.E., Mr. C. G. Morley New, M.I.E.E., and Mr. W. J. Oswald, A.M.I.E.E. **Southern:** Mr. A. Creech Jones and Lt.-Col. D. S. Kennedy, D.S.O., J.P., M.I.Mech.E., M.I.B.Ag.E. **South Western:** Mr. A. N. Irens, M.I.E.E., A.F.R.Ae.S., and Mr. H. M. Medland, J.P. **South Wales:** Mr. L. Parsons. **East Midlands:** Ald. A. Joyce, C.B.E., J.P., Ald. J. Minto, J.P., and Ald. A. Sturgess, O.B.E., J.P. **North Eastern:** Mr. C. I. C. Bosanquet, M.A., D.C.L., Col. E. G. Angus, C.B.E., M.C., T.D., D.L., and Ald. C. F. Sanderson, J.P. **North Western:** Mr. J. R. Potts, O.B.E., J.P., and Mr. E. J. Smith.

Mr. W. L. Henderson, A.M.I.E.E., has relinquished his secretarial post with the Engineers' Guild to become London sales manager for Dowding & Mills, Ltd. Mr. Henderson received his early training with W. T. Henley's Telegraph Works Co., Ltd., after which he was commercial engineer to the former Central London Electricity, Ltd. During the war he served in the Royal Engineers and was later assistant secretary to the Association of Supervising Engineers. Mr. Henderson's new business telephone number is Amherst 3119.

At **Brook Motors'** annual sales conference at Huddersfield on 23rd March, ten people received awards of their own choice for the completion of twenty-five years' service with the firm. Among them was Mr. John L. Brook, vice-chairman and joint managing director, the younger son of the founder, Mr. Ernest Brook, who presented the awards. Mr. F. V. Brook, managing director, was in the chair. Mr. J. L. Brook proposed a vote of thanks to the founder and Mr. Percy Parr seconded it.

OBITUARY

Mr. F. P. Best.—The death, on 26th March, is announced of Mr. Frank Powell Best, M.Sc. (Cantab.), B.Eng., B.Sc., technical manager of the Marconi International Marine Communication Co., Ltd., and the Marconi Sounding Device Co., Ltd. He was fifty-two. Born at St. Helens, Lancs, Mr. Best was educated at Prescot Grammar School and Liverpool and Cambridge Universities. At Cambridge he took the M.Sc. degree and was Alan Brodey Prizeman of Gonville and Caius College. He took his B.Sc. at London and B.Eng. at Liverpool, where he was a David Rew Scholar. He joined the Radio Communication Co. in 1924, and was engaged in test work until 1928 when, following the amalgamation with the Marconi International Marine Communication Co., Ltd., he transferred to the latter company. A year later he was appointed assistant technical manager and in 1932 became deputy technical manager.

In 1934 Mr. Best transferred to Marconi's Wireless Telegraph Co., Ltd., to assist in the development of equipment for marine use, and in 1939 returned to the Marconi Marine Company as technical manager while retaining the title of assistant technical manager in Marconi's Wireless Telegraph Co., Ltd. In 1940 he was also appointed technical manager of the Marconi Sounding Device Co., Ltd., and later in the same year relinquished his position with Marconi's Wireless Telegraph Co., Ltd., to concentrate entirely upon technical research and development in electronics for marine use.

WILLS

Mr. S. B. Donkin, M.I.C.E., M.I.Mech.E., M.I.E.E., senior partner in the firm of Kennedy & Donkin, consulting engineers, who died on 12th November last, left £60,007 gross (£52,932 net).

Mr. E. S. Williams, superintendent of the Cwm Dyli power station, Snowdonia, of the Merseyside and North Wales Division, B.E.A., who died on 22nd November last, intestate, left £3,922 gross (£3,882 net).

Mr. F. Croft, former chairman and managing director of Crofts (Engineers), Ltd., who died on 28th October last, left £120,440 gross (£118,544 net).

Damages Against N.W. Board

AT the Manchester Assizes on Saturday last Mr. Justice Barry awarded £10,000 and costs to the widow of a fireman who received a fatal shock at a Salford pickle factory fire in 1950. The claim was made against the North Western Electricity Board and the occupiers of the factory, Mayoh & Co.

His Lordship apportioned the responsibility for the fatality as to 90 per cent against the Board and 10 per cent against Mayoh & Co. He said that he was forced to the conclusion that in the course of work carried out by employees of the Board two wires had been wrongly connected and the accident was due to this faulty work. The occupiers could reasonably have assumed that work carried out by the Board had been done properly.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electricity Supply Policy

IN *The Times* of 25th March, Lord Citrine is quoted as having said the following, when addressing a conference of housecraft advisers and demonstrators:—

> "During recent years Electricity Boards had been placed in the anomalous position of having to spend money on warning people not to use electricity at peak periods. Promotional advertising had been frowned upon by successive Governments, and it was no wonder that many had assumed that it was against the national interests to use electricity at any time.
>
> "This phase of negative publicity is passing, and I hope the time is not far distant when the Boards may be able to engage in a reasonable measure of promotional advertising. If the Boards are to keep prices from rising, with the increased costs of fuel, transport and labour, they must be put in the position of being able to sell infinitely more electricity and so keep the generating stations more fully occupied over the 24 hours of the day."

Of course, a newspaper report cannot usually give the full text and it may well be that something vital has been missed out. Surely, however, there is something wrong with the thought behind the last sentence. Do Area Boards have to be "put in the position of being able to sell infinitely more electricity"? They could do it now if they really applied their minds to the problem of selling off-peak units at attractive rates. How many are doing this? Does a time-switch which might save 3 kW of peak really cost more than the £180/£200 which we have to pay for the plant? Can the electricity supply industry afford to drop the warnings not to use electricity at peak periods?

In my opinion the electricity supply industry has had only three ruling ideas right from its inception, viz., to maintain continuity of supply, to sell more and more units every year, and to build more splendid buildings for power stations. Knowledge of the complete change which has come over the economic situation of the country has evidently not penetrated into the policy-making quarters of the supply industry. May I suggest, as now being more suitable, that it should charge more for a continuous supply; sell more electricity at off-peak times only; and hold an open competition, with handsome prizes, for the design of a really austere and purely functional power station building, the judges to have no previous connection with the supply industry.

NON-TECHNICAL.

Discounts to Board Employees

I REFER to a paragraph which appeared on page 643 of the *Electrical Review* of 20th March, in connection with a complaint raised at a meeting of the Brigg Chamber of Commerce.

The circumstances of this case have been investigated. An employee purchased a television set at less than the full retail price, subject to the Board's standard condition that the set was purchased for his personal household use. The employee's explanation is that he initially installed the set in his own house but later removed it to the home of his married daughter (who is an invalid) as he and his wife spend a lot of time with her and intend in the near future to give up their own home and go to live with the daughter.

This was done without the Board's permission and is not in accordance with its conditions. The man was, therefore, instructed that he must either return the set to his own house or pay the full retail price. He has now taken the set back to his own home.

JOHN M. DODDS,
Secretary,
Yorkshire Electricity Board.

Scarcroft, Leeds.

Back-Pressure Generation

THE use of the infinitely variable speed steam engine is much to be preferred to the electric motor for many purposes. Why drive an induced, or a forced, draught

fair with an electric motor when a steam engine exhausting into a hot well, or the hot water service, will be 70 per cent thermally efficient against the 26 per cent of the electric motor?

Mr. F. A. Richmond calls for the replacement of pressure reducing valves with back-pressure engines. How right he is! They both do exactly the same thing only one goes up and down and round and round while the other "stays put." The engine or turbine, used correctly, has a very high thermal efficiency while the normal reducing valve adds superheat to the low pressure side which may be detrimental to heat transfer.

Those who have any doubts as to the high contribution that back-pressure sets can make toward the national welfare in saving coal and electricity—both in short supply—should read Mr. Oliver Lyle's book on "The Efficient Use of Steam," written on behalf of the Fuel Efficiency Committee of the Ministry of Fuel and Power.

Nottingham. E. G. PHILLIPS, O.B.E.
E. G. Phillips Son & Norfolk.
Consulting Engineers.

KITIMAT HYDRO-ELECTRIC SCHEME

PARTICULARS of the hydro-electric system under construction by the Aluminum Co. of Canada, Ltd., for providing 1,235 MW at a new reduction plant 50 miles from the power station and situated on the Kitimat River, British Columbia, were given to the Royal Society of Arts by Mr. F. L. Lawton (chief engineer, Aluminium Laboratories, Ltd.) on 27th March. After a reference to the several large aluminium plants already in existence in Canada, the lecturer detailed the general conditions that determined the nature of the civil engineering work necessary for the present scheme. The first essential feature, the Kenney Dam, provides the main storage, and is situated at the head of the Grand Canyon of the Nechako River; the water from the power station is to be discharged into the Kemano River. Nearly 7,000 cu ft/sec at a net head of 2,500ft will be available at the turbines, four turbines being served by each of a pair of 11ft diameter pressure conduits.

Kemano power station, when completed, will be the largest underground station in the world and will house sixteen vertical single-runner four-nozzle impulse turbines, each of 150,000 h.p. at 327 r.p.m. The voltage of each pair of alternators, rated at 106 MVA at 60 deg C and 122 MVA at 80 deg C temperature rise, will be stepped up from 13·8 to 300 kV by a double-primary bank of three 71–89 MVA single-phase transformers, the output of which will be delivered to the outdoor substation through 2,250ft of 300 kV oil-filled (60 lb/sq in) single 0·4 sq in paper insulated cables, carried in open racks in tunnels 4in in external diameter.

One of the two manufacturers is supplying a cable with an aluminium sheath and conductors. Generator protection consists of split phase differential using double-primary current transformers and back-up relays of phase over-current and neutral. Main power transformers will have earth differential and transformer differential relays embracing the outdoor circuit breakers. Auxiliary services are to be supplied at 600 V through 2·5 MVA transformers tapped from the 13·8 kV generator leads.

For the first ten miles of the fifty miles of transmission lines two double circuits are proposed, after which two single circuits will run through narrow valleys to a maximum altitude of 5,300ft, where snow lies 20ft deep or more in the winter.

For the double circuit lines 1·25 sq in s.c.a. conductors and for the single circuit lines 2·65 sq in s.c.a. conductors are to be employed.

The whole system was set up on a network analyser, which indicated the need for 400 MVAr of capacitors.

Australian Electrical Improvements

Part of the proceeds of a £A27 million loan issued by the Commonwealth Government is to be used for the improvement of electricity supply

Financial Section

STOCKS and SHARES

STOCK Exchange markets are quiet and subdued, as is customary in the week before Easter. The present atmosphere contrasts with the activity which has frequently characterized most sections of the House during the first quarter of the year. Generally speaking, both gilt-edged stocks and industrial shares are being firmly maintained. Enterprise is, of course, constrained by the near approach of the Budget.

Following the successful issue of the £2 million Northern Ireland Electricity 4¼ per cent stock 1968/71, at 99, another and larger offer came last week from the North of Scotland Hydro-Electric Board, which invited subscriptions to £20 million of 4 per cent stock, redeemable 1973/78, at 96. It is guaranteed by the Treasury and, like the Northern Ireland stock, ranks as a full trustee security. Terms of the offer were regarded as being pitched fairly well up to the prevailing market level, but, with gilt-edged stocks continuing in favour, it was expected to have a reasonably favourable reception. By gilt-edged standards, the amount involved was on the small side, and there is a good deal of discussion as to whether these two operations are the precursors of something on a much larger scale.

Brush Results

The decision of the Brush Electrical Engineering Co. to pass its final ordinary dividend for 1952 came unexpectedly to the market, and resulted in an initial marking down of the 5s shares from 5s 3d to about 4s. Shareholders had received a total of 10 per cent for the previous year and an interim payment of 4 per cent on account of the latest period. A statement from the company shows that a net loss of over £300,000, incurred on Indian contracts, spoilt what would have been otherwise a satisfactory outcome to the year's trading, for the Brush Aboe group's net profit of £426,000, although lower than before, would have provided comfortably for the maintenance of the usual final dividend. Working capital considerations also affected the dividend decision.

Coming Dividends

April is ordinarily the big month for company dividend and profits announcements in the electrical equipment market. With necessary reservations connected with the Budget, it can be concluded from the behaviour of share prices over the last two or three months that events are awaited this time with confidence, and with a cautious measure of optimism in some directions. Two of the most interesting of the declarations expected shortly are those of C. A. Parsons and A. Reyrolle & Co. whose shares have been particularly well favoured in the market this year. In the "heavy" group, Babcock & Wilcox and Vickers both declared final dividends in April last time, as did Ever Ready and Chloride Electrical. Announcements came also from Lancashire Dynamo, Allen West, Laurence Scott, British Thermostat and Watford Electric.

Cable Shares

The good figures published recently by the Telegraph Construction & Maintenance Co., and the small increase in the year's distribution, give added interest to the annual results due from others in the cable manufacturing group. British Insulated Callender's, which has more than three million new shares ranking for dividend this time as a result of last year's cash issue, produced a small increase in the distribution at about this time last year, without departing from a highly conservative dividend policy. The company has been in the news with its decision to invest $3 million in the acquisition of a Canadian firm of cable manufacturers. W. T. Henley's capital has been increased since last year's dividends by a cash issue and a subsequent 100 per cent share bonus; in this case, too, the dividends of recent years have been well within earnings. Results are expected this month from Johnson & Phillips. Siemens declared their single annual payment in May last year.

Company News

Newman Industries' 5s shares hardened a shade to 2s 6d following the company's announcement of a repetition of the single ordinary dividend for the year at 10 per cent, and of profits also little different from the previous figures. Telephone & General Trust is continuing the remarkably long line of 8 per cent annual payments. It involves this time a larger cash distribution, since the new shares issued nearly a year ago qualify for participation. Group net profits are about 30 per cent up on the previous year. Recent interest in the shares, now quoted at 32s 6d, has been influenced by the meteoric rise in the price of Telephone Properties shares, in which the Trust is substantially interested. Telephone Properties are at 63s compared with 32s at the beginning of this year.

Owing to Easter arrangements our usual share list is omitted from this issue.

REPORTS and DIVIDENDS

The Telegraph Construction & Maintenance Co., Ltd.—The main figures in the accounts for 1952 were given in our last issue. In his circulated statement, Lord Colgrain (chairman) says that the difficulties in connection with the supply of raw materials gradually eased during the year under review, and during the latter half their machine capacity and manpower were worked to a maximum, with the result that production and turnover were considerably higher than in the previous year and the trading profit also increased. Their operations continue to expand throughout the Commonwealth, as well as with other countries. During the past two or three months orders have been coming in rather more slowly than of late but they are fortunate in starting the year with a substantial volume of orders in hand. The expansion of the operations of their subsidiary company, Telcon Cables (S.A.) (Pty.), Ltd., has been arranged in collaboration with their local associates Ash Brothers (Pty.), Ltd. The Selborne Plantation has been working satisfactorily and profitably during the year in spite of the difficulties which still prevail in Malaya. Submarine Cables, Ltd., which is managed at the Greenwich works on behalf of Siemens Brothers & Co., Ltd., and Telcon, has had a satisfactory year, and the company has a good order book. Their joint work with Johnson & Phillips, Ltd., has continued successfully and during the year they were able to arrange joint operations in several countries overseas. They have also invested in a new associated company, Chapelhall Cables, Ltd., formed to manufacture a special type of plastic cable. Accommodation at the Greenwich works is becoming insufficient for the work they are doing and for the expected developments and commitments in the immediate future and they have decided to transfer the Metals Division to the new industrial estate at Crawley.

The Brush Electrical Engineering Co., Ltd., in its report and accounts for 1952, states that owing to the exceptional loss on its Indian contracts and the continued shortage of working capital, no final dividend is to be paid. Last December an interim dividend of 4 per cent was paid on the ordinary stock. For 1951 a total of 10 per cent was paid. The net profits, before tax, from the sales of the Brush Aboe group totalled £1,174,767, as compared with £1,667,624 for 1951, and after deducting £748,853 for taxation there is a balance of £425,914 (against £588,552). From this balance is deducted a loss to date on initial contracts for tube wells in India, after deducting £195,200 in respect of tax relief thereon, of £308,970, leaving a net balance of £116,944. To this is added £298,361 brought in, and after paying the preference dividends and deducting the amount paid as interim ordinary dividend, the balance carried forward is £332,254.

The directors state that the net earnings of the group from its normal trading and selling activities would have enabled the usual final ordinary dividend to be maintained by a considerable margin. Before the end of the year, however, it had become clear that A.T.W. was not making satisfactory progress in the completion of its tube well contracts for 965 wells in the Punjab, the United Provinces and Uttah Pradesh, and arrangements were accordingly made for a special investigation into the position arising under these contracts to be made by one of the company's joint auditors, Blackburns Robson Coates & Co. As a result of the report received from this firm on the completion of the investigation in February, 1953, the board is faced with the necessity of making provision for a realized loss of £504,170 up to 31st December, 1952, and an estimated further loss to the completion of the contract of £180,000.

Mather & Platt, Ltd.—The annual meeting was held on 26th March, Mr. L. E. Mather (chairman) presiding. In his circulated statement, the chairman said that with the improvement in supply of materials the rate of production during the year under review increased, and they were able to deliver and invoice a larger volume of contracts than ever before.

Hilger & Watts, Ltd.—In the course of his speech at the annual meeting held on 26th March, Mr. G. A. Whipple (chairman and managing director) said that during recent months they had been transferring a large part of their production to the new factory at Debden. The United States was now their largest market and Canada was well on the way to second place. Developments in East Africa had led to the formation of Scientific Exports (East Africa), Ltd., and with trained technical staff now in that territory they had high hopes of increased sales.

J. Stone & Co. (Holdings), Ltd., is to issue 171,543 new " A " ordinary £1 shares at 50s a share to holders of the ordinary and " A " ordinary stock in the proportion of one new " A " ordinary for every seven ordinary and " A " ordinary stock units held.

The Superheater Co., Ltd., proposes to pay a final dividend of 25 per cent on the ordinary and " A " ordinary capital as increased in February by an issue of " A " ordinary shares. An interim of 10 per cent has already been paid on the smaller capital. The

distribution for 1951 was 32½ per cent. The profit of the parent company for 1952, after meeting all charges, including taxation of £220,018, is £179,189 (against £164,412 for 1951).

The British Vacuum Cleaner & Engineering Co., Ltd., in its accounts now issued, shows a group trading balance of £216,804 for 1952, as compared with £284,901 for 1951, and a net balance, before taxation, of £142,439 (against £211,320). Taxation absorbs £83,538, and it is proposed to place £6,872 to general reserve. As already announced, the dividend for the year is unchanged at 25 per cent, and £115,839 is carried forward (against £99,798 brought in).

Wolf Electric Tools (Holdings), Ltd., reports group profits for 1952, after deducting £267,358 for taxation, of £51,775, as compared with £30,837 for the preceding nine months. The sum of £15,000 is transferred to general reserve in the accounts of the subsidiary company, and it is proposed to pay a dividend for the year of 15 per cent (against 10 per cent for nine months). The balance carried forward is £21,164 (against £6,922 brought in).

The Telephone & General Trust, Ltd., reports a group profit for 1952, after meeting all charges, including £130,730 for taxation, of £194,969, as compared with £148,806 for the preceding year. The profit attributable to the holding company is £151,111. The dividend for the year on the "A" ordinary stock is unchanged at 8 per cent, and it is proposed to pay a final dividend of 5 per cent on the ordinary stock, making 8 per cent for the year (same). Revenue reserve receives £20,000 and £104,121 is carried forward (against £100,345 brought in).

The Metropolitan Electric Cable & Construction Co., Ltd., reports a net profit for the year ended 31st December last of £46,476, after providing £92,500 for taxation, as compared with £43,181 for the preceding year. It is proposed to pay a final dividend of 40 per cent (against 15 per cent), making 50 per cent for the year (against 25 per cent).

Newman Industries, Ltd., reports a trading profit for 1952 of £183,776, as compared with £189,146 for the previous year, and a net profit, after deducting £71,000 for taxation, of £24,320 (against £26,761). Reserve receives £4,409, and it is proposed to maintain the dividend for the year at 10 per cent. The balance carried forward is £102,954 (against £102,910 brought in).

Darwins, Ltd., propose a final ordinary dividend of 8 per cent, making 12 per cent for the year, and a cash bonus of 2 per cent.

Joseph Lucas (Industries), Ltd., has declared an interim dividend of 1⅔ per cent (unchanged).

New Companies

Chas. Richardson & Sons, Ltd.—Registered 19th March. Capital £15,000. To acquire the business carried on at Romiley, Ches, as Charles Richardson & Sons, and to carry on the business of electrical and mechanical engineers and contractors, electrical installation contractors, etc. Directors: W. Richardson, R. A. Ward, D. P. Ward, J. R. Worsley and J. Eaves. Regd. office: Green Lane, Romiley, Ches.

Percy Lord & Son, Ltd.—Registered 11th March. Capital £2,000. To acquire the business of an electrical contractor carried on by Percy Lord at 1, Leicester Road, Countesthorpe, Leics. Directors: P. Lord and M. Lord.

E. A. Clark (Electrical), Ltd.—Registered 10th March. Capital £100. Electrical and mechanical engineers and contractors, etc. Directors: E. A. Clark, H. G. Stumbles, Joan A. Clark and Marjory M. Stumbles. Regd. office: Balfour House, Finsbury Pavement, E.C.2.

Beaumont (Television), Ltd.—Registered 13th March. Capital £100. Electricians, television, radio and mechanical engineers and manufacturers, etc. Directors: F. H. Beaumont and W. E. Sykes. Regd. office: 2, St. Peter's Street, Huddersfield.

Fernbank Electrical Co., Ltd.—Registered 16th March. Capital £100. Electrical engineers and contractors, etc. The first directors are to be appointed by the subscribers. Secretary: T. A. Herbert, 128, Albany Street, N.W.1.

Ultra-Violet, Ltd.—Registered 10th March. Capital £100. Medical, technical, electrical and scientific lamps and apparatus, etc. Directors: A. J. De Castro Basto, Beryl E. Graves and Adelino V. Gosano. Regd. office: 69, Gloucester Place, W.1.

Braine & Parris, Ltd.—Registered 16th March. Capital £6,000. Electrical engineers and general electrical installation contractors, etc. Directors: E. S. Parris and E. A. S. Parris. Regd. office: 63, Seaside Road, Eastbourne, Sussex.

Bankruptcies

H. W. Sharp, residing and carrying on business at 178, Osmaston Road, Derby, under the style of "Willdays," electrical and radio engineer.—Last day for receiving proofs for dividend 13th April. Trustee, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

J. S. Anderson, trading as "Electronic Services," at Nearavon, Salisbury Street, Fordingbridge, Hants, radio and electrical engineer.—Last day for receiving proofs for dividend 12th April. Trustee, Mr. A. H. Brown, The Square, Fordingbridge.

Electrical Engineers' Exhibition

Success of Last Week's Display at Earls Court

THERE was an excellent attendance at the second Electrical Engineers' Exhibition held by the Association of Supervising Electrical Engineers at Earls Court, London, last week. Particular interest was shown in the special display comprising "Cooker Avenue," in which six manufacturers showed examples of their latest designs and ideas, and "Illumination Way," which consisted of three lines of illuminated fittings, each 200ft long with fittings at every 10ft.

At the official opening at the A.S.E.E. stand, those present were welcomed by the organizer of the exhibition, Mr. P. A. Thorogood. Performing the opening ceremony, Sir John Hacking, deputy chairman (operations) of the British Electricity Authority, declared that the exhibition filled a vacant space in the electrical industry. At first glance, he said, it might be surprising that the exhibition was being held by the A.S.E.E. Its articles of association, however, provided for the assistance of progressive movements and the promotion of technical education among those engaged in the electrical industry.

This justified the holding of exhibitions, which was one of the best ways of education. The exhibition provided participants with an excellent opportunity to make contact with those people who were going to use their products. Sir John congratulated the organizers on the arrangement of the exhibition and mentioned particularly the effectiveness of "Illumination Way" and "Cooker Avenue." He referred also to the value of the awards, in the form of silver engraved plaques, to be made for the best domestic and industrial labour saving appliances shown at the exhibition.

Sir John Hacking opens the exhibition. On his right is Col. B. H. Leeson, President, I.E.E. and on his left Mr. E. R. Wilkinson (B.E.A.)

Mr. C. T. Melling, president of the Association, thanked Sir John for performing the ceremony and stressed the wide scope of the exhibition. He also thanked Mr. Thorogood for organizing the event.

At the luncheon *(left to right)*: **Col. B. H. Leeson, Mr. L. L. Emmett (chairman, A.S.E.E.), Sir John Hacking, Mr. C. T. Melling (president, A.S.E.E.) and Dame Caroline Haslett**

At the official lunch held in connection with the exhibition Mr. L. L. Emmett, chairman of the A.S.E.E., said that sound foundations had now been laid for the exhibition and its future success was in the hands of the electrical industry. Mr. G. M. C. Peacock (B.E.A.M.A. Publicity Committee) and

Mr. W. J. Jones (director, Electric Lamp Manufacturers' Association) spoke on behalf of the manufacturers.

In the opinion of the judges no exhibit completely fulfilled the conditions envisaged for the Domestic Labour Saving Award and the basis of adjudication was amended. Finally it was decided to give the award for the Santon " Otter " immersion heater. The Lancashire Dynamo & Crypto, Ltd., received the Industrial Labour Saving Award for its coil taping machine, which is claimed to be forty times faster than hand taping.

ECONOMIES IN WIRING PRACTICE

At a Utilization Section meeting of the Institution of Electrical Engineers held in London on 19th March there was a discussion on economies in wiring practice, the proceedings being opened by Messrs. Forbes Jackson, A. V. Milton and P. McKearney. A discussion, opened by the same three speakers, was held in Liverpool under the chairmanship of Mr. W. A. Hatch, chairman of the North Wales Centre, on 2nd March, when eight contributors took part. Thirteen speakers took part in the discussion in London when Dr. J. W. T. Walsh presided.

There was a general feeling that electrical engineers were not behindhand in seeking economy and that many of the desirable steps in this direction had either already been taken or could readily be fitted into the existing practice as described in the Institution's Regulations. A distinction was drawn between economy in materials, in labour and in planning and design, and particular importance was attached to planning and design. Too often large installations had to be designed after the structural and mechanical design was settled and the resulting urgency was a fruitful cause of needless expense. Greater attention could well be given at the planning stage to probable diversity and to the extent and nature of probable future developments. There was a risk that savings in materials unless properly planned might involve increased use of labour, e.g., in the time taken for installation. However, small but significant savings in materials were possible, particularly in commercial and industrial buildings.

The desirability of some reduction in the variety of wiring systems was put forward and the possibility of abandoning the use of lead-sheathed cable was instanced. Differing opinions were expressed on the merits of lug-grip light-gauge conduit and the possible alternative of insulated conduit was mentioned. Tough-rubber-sheathed and similar wiring systems were often adequate where requirements for mechanical protection were not stringent. Continuous busbar systems were economical in insulation and labour but not in copper. Novel techniques such as the formation of ducts by inflatable tubes appeared to offer promise. Cable trunking, catenary wiring and earthed concentric wiring offered advantages, earthed concentric wiring being claimed to offer economy in material combined with reduced volt-drop and power loss.

There had been a steady improvement in the quality and design of components, although further improvement could be looked for regarding ease of installation and not all components at present withstood their rated load without overheating.

Supply undertakings were stated to have been reluctant on occasion to support the use of more economical methods of wiring in consumers' installations, and it was pointed out that the Electricity Supply Regulations, 1937, provided safeguards but did not prescribe detailed requirements other than a maximum leakage current to earth. The use of the sheath of the incoming supply cable as earth electrode was desirable and could in many areas be used subject to completion of a form of indemnity.

The present emphasis on economy was justifiable owing to the national need for greater productivity in relation to immediate capital expenditure. It was necessary, however, to make as much provision as possible for future developments in order to minimize the heavy cost of subsequent alterations which would otherwise be incurred.

Housecraft Conference

Preparing Demonstrators for a Return to Normal Conditions

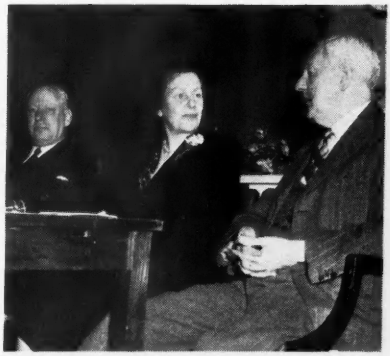
OVER 300 delegates from all parts of Great Britain and Northern Ireland attended the Conference of Electrical Housecraft Advisers and Senior Demonstrators held jointly by the British Electrical Development Association and the Electrical Association for Women in London last week. With the greater availability of labour-saving appliances and the resumption of more normal conditions of supply the conference aroused exceptional interest and the stimulating discussions augur well for the future progress of the industry.

Presiding at the opening session on Tuesday, Dame Caroline Haslett, director of the E.A.W., said that the resumption of the conference after an interval of two years was an indication that electricity was going ahead again. All would agree upon the value of public relations and the part played by the demonstrators was becoming more and more important.

Officially opening the conference, Lord Citrine, chairman of the British Electricity Authority, declared that the handicaps under which the electricity supply industry had laboured during the last five years were now being successfully surmounted and, apart from peak periods in exceptionally cold weather, consumers could obtain all the electricity they needed. Those serving in the industry could take a measure of pride in the progress made during the last five years. The number of consumers had increased by 2,300,000 to about 14,000,000, sales of electricity rising by about 45 per cent. Expansion of consumption in industry had been greater than that of domestic consumers: industry was taking about 50 per cent more than it did five years ago, and domestic consumers about 30 per cent more. The demand for electricity had, however, slackened during the last year, and the indications were that the increase in total sales would be about 3 per cent.

The policy of the Boards had been to keep down the price of electricity to the lowest level compatible with financial stability. Despite the recent increase in the price of coal, which would add several million pounds to the costs of the industry, the Boards were still struggling to avoid increases in their tariffs. The price of coal supplied to the generating stations had risen to about three times its pre-war figure, and now formed nearly 70 per cent of the total costs of electricity generation, yet the average overall increase in electricity charges was still less than 20 per cent above pre-war level. This had only been made possible by an increase in thermal efficiency from a national average of 20·8 per cent in 1947 to 22·6 per cent in 1952; this was equivalent to a saving of over 3 million tons of coal a year. In these days when coal conservation was so important, it could not be too often stressed that savings up to 14 million tons a year could be achieved by the electrification of the railways and the coal mines alone.

There had undoubtedly been a measure of industrial recession during the past twelve months, and this did not yet appear to have been completely overcome. It might indeed be the major factor which had restricted the rate of increase in electricity sales.



Mr. V. W. Dale, Dame Caroline Haslett and Lord Citrine at the opening of the conference

The lack of positive advertising was no doubt also a factor in restricting sales. During recent years the Electricity Boards had been placed in the anomalous position of having to spend their money year by year in warning people not to use electricity at peak periods. Anything in the way of promotional advertising had been frowned upon by successive Governments, and it was no wonder in these circumstances that the public had become confused and many had assumed that it was against the national interest to use electricity at any time.

This phase of negative publicity was passing, and he hoped the time was not far distant when the Boards might be able to engage in a reasonable measure of promotional advertising. Restrained publicity would be by far the best way of selling electricity, and healthy competition between gas and electricity was in the interest of consumers. If the Boards were to keep prices from rising they must be able to sell infinitely more electricity and so keep the generating stations more fully occupied over the twenty-four hours of the day. They could not afford *not* to develop the domestic load. The high rate of purchase tax on domestic electrical appliances and the restrictions on hire purchase were both hampering sales. He believed, however, that no industry in the country had a brighter future than the electrical industry.

Cooking Load

Speaking on "The Importance of the Cooking Load" Mr. N. F. Marsh, chief commercial officer, East Midlands Electricity Board, said that domestic electricity consumption had grown steadily over the years and electric cooking had played a most important part in this growth. The domestic tariff structure was firmly geared to the extensive use of electricity for cookers and other appliances, and it was essential, if the price of electricity was to be kept down, that this high rate of consumption should be maintained or increased. If the full demand of cookers fell on the industry's generation "peak" they would be an expensive load to supply, but fortunately this was not the case. The main peak load occurred at 8.30 a.m. or 5 p.m. and many families had to complete their electric cooking before 8 a.m. to get the workers off to their places of business and their children to school. In the afternoon, many workers had left their place of business before their cookers were switched on at home to cook their evening meal. This resulted in a high diversity and there was no doubt that it was a remunerative load to the industry and must be encouraged.

Gas prices, in the main, had increased more than electricity prices since vesting date and there was no doubt that electricity was generally competitive with gas on the score of cooking cost: in many districts it was cheaper.

With the modern electric cookers available, we should be more than able to meet gas competition, but it was imperative that sales or hire of electric cookers should be increased so as to enable manufacturers to turn out the kind of cookers needed at prices which would compete with gas cookers. Features in favour of the electric cooker were its cleanliness, superior grill and plate warming facilities, radiant type boiling plates used in conjunction with a simmering device, ovens with a better heat distribution and in which the whole of the space could be used for cooking, and the fact that electric cookers did not consume oxygen or pollute the air.

Too many local authorities were inclined to give the Electricity Boards the lighting, radio and television, and other small apparatus load and allow the Gas Boards to take the cooking and water heating. They must insist that new houses were given the choice of electrical or gas equipment where services were provided by the local authority or that the equipment was shared between the two industries where it was provided by the Housing Department. It was still essential to have a simple hire scheme to satisfy consumers who could not afford hire purchase.

Increased Competition

In the discussion which followed Mr. Marsh's paper, Mrs. Messenger (Eastern Electricity Board) said that competition with the gas industry was going to be fiercer. Demonstrators should know the gas charges in their districts and should use electric cookers in their own homes so that they could talk from experience. Cookers were lent to schools free of charge for educational purposes. Mrs. Lockley (Midlands Electricity Board) advocated continuous demonstrations in showroom windows, the preparation of plainer dishes, and emphasis on electricity's cheapness and the availability of low price cookers for credit

sales. Miss Leader (G.E.C.) asked for lower installation costs and stressed the value of demonstrations in works canteens.

Tuesday afternoon was occupied by addresses by Mrs. E. R. House, H.M. Inspector of Housecraft, Ministry of Education, on "Food in the Teaching of Housecraft," and by Miss M. Marris (Caroline Haslett Trust exhibitioner) on her visit to Norway.

The Demonstrator's Art

A number of practical hints to the demonstrator were given on Wednesday morning by Miss Edna M. Eaves (E.D.A.) in a talk on "The Art of the Demonstrator." She described simple exercises which would improve the health, voice and appearance of the demonstrator and increase her confidence. It was, she said, the attitude of the demonstrator and the good results she obtained with the appliances she used that could do much to inspire the consumer to use electricity for everything.

Miss Eaves' talk was followed by a practical demonstration in which Miss Jean Clapperton (Sunvic Controls, Ltd.), Mr. J. A. Stedman (E.D.A.) and Mrs. Janet Walker (tutor demonstrator, Vegetarian Catering Association) co-operated. Miss Clapperton advocated the use of radiant plates and radiant grill boilers in view of their quicker heating, more rapid response to control, and the ability to take any type of cooking utensil. She had been unable to obtain any proof of their shorter life compared with solid plates. Apart from its more obvious advantages, "Simmerstat" control made possible the use of single circuit plates which cost 5s–7s less than two circuit units.

Mr. E. M. Ackery (E.D.A.), speaking on "Some Aspects of Commercial Catering," said that the badly planned or not-planned-at-all commercial kitchen would be a handicap to the staff and cause much wastage of effort and labour, if not of money. It was important to study the sequence of events in a large kitchen, for the art of good planning was for the food to flow through its appropriate channels with as little crossing of the channels as possible. "The Practical Side of Commercial Catering" was presented by Eileen Cassidy, catering officer, London Division, B.E.A.

In special displays of E.D.A. and E.A.W. services and of deep-freeze packaging, the "Electric Cookery Book" was "brought to life" by Ester Purvis and the "Cold Cookery Book" by Ursula Jackson (Electrolux, Ltd.).

Thursday was occupied with visits to the Building Centre, where Marguerite Patten (B.B.C. Television) gave demonstrations of small appliances, and to the Ideal Home and Electrical Engineers' Exhibitions.

Speaking on Friday on the subject of "Consumer Relations and Us" Mary Gilbert (E.D.A.) said that selling was a state of mind. It was the result of inner mental conviction and enthusiasm on the essential function of the product to be sold.

A discussion followed on various matters raised during the course of the conference. The individual practices of the Electricity Boards with regard to cooker installation costs and their inclusion in credit sales charges provided the first topic dealt with.

Life of Hotplates

With regard to hotplates, Miss Leader (G.E.C.) said that experiments carried out by her company showed that the life of a radiant plate was about $5\frac{1}{2}$ years, while that of the solid plate was a little less. There was little to choose between their performance and efficiency except in the boiling of small quantities of water.

Mr. P. Honey (E.D.A.) pointed out that the efficiency of solid plates increased for larger quantities of water and said that research was continuing on the reduction of thermal inertia. Miss Gilbert said that solid plates were obsolete in the United States. Mr. Honey also stressed the importance of considering gas pressures, which were often low, when comparing the relative performances of gas and electrical appliances. Mr. E. M. Ackery said that there was no evidence of the radiant plate penetrating the commercial cooking field.

The importance of securing good relations with schools and the methods of achieving them were indicated by Mrs. Stewart (Folkestone). Miss Laffon Anderson (Copenhagen) spoke about her work in Denmark.

At the luncheon which concluded the conference Lord Citrine said it was as important for the industry to keep its employees informed of what it was doing as to advertise its products. They were getting to the point where policies were formed by adequate consultation with those who had to carry them out.

Auxiliary Oil Firing

Increasing Output Capacity and Reducing Grit Emission

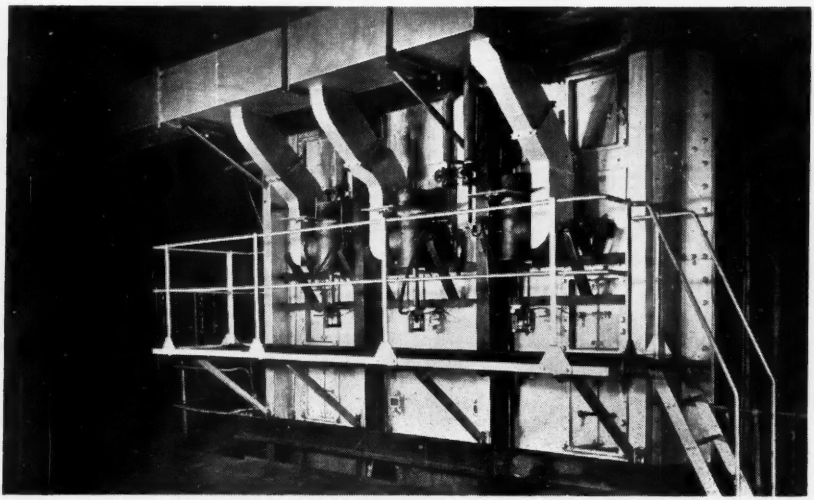
TO improve combustion at the British Electricity Authority's St. Pancras power station, oil burning equipment has been installed on its four pulverized coal fired boilers. Hitherto boiler output has been restricted by the need to reduce smoke and grit emissions and by the inferior coal available. This was largely due to lack of pre-heated air for milling the coal, particularly when starting up the boiler, since the high moisture content of the fuel in the bunkers caused smoke puffing.

The equipment selected was the " Type FF2A initiator " of Fuel Firing, Ltd. The oil burning unit is fully retractable from the furnace, so that its precision parts are protected from radiant heat and from the deposition of coal and ash when not in use. It comprises a sprayer tube carrying an atomizer which consists of three precision ground plates which have been found to give the best atomization as shown by the ease with which the burners are lighted in a cold boiler after a prolonged shut down, thereby eliminating the danger of unburned oil in the furnace. This design also facilitates periodic inspection.

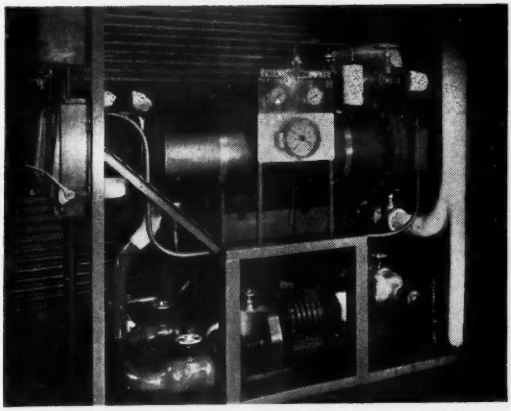
Air is introduced round the sprayer tube; primary air secures stable ignition, irrespective of furnace conditions, and keeps the atomizer cool, thus preventing the build up of carbon deposits. Secondary air is passed through a swirler consisting of a number of blades round the periphery of the burner which create the requisite turbulence for complete combustion. The whole burner tube is mounted on a shaft which is carried in two bearings fixed to the main frame of the assembly; the unit is thus simply rotated about a horizontal axis into and out of the furnace, the opening being sealed by closing plates during insertion or retraction.

The capacity of each burner is 400 lb/hr of oil, which supplies sufficient heat for

Three initiators in fully retracted position



generating 4,200 lb/hr of steam. One forced-draught fan delivers sufficient air at constant speed and correct pressure for all the initiators on two boilers. Variation in load is by cutting in or out of individual initiators, thus keeping a constant air-fuel ratio. Means of observation and access are combined in the closing plate when the burner is in commission. The oil is ignited by a hand torch on starting; interlocks on the oil supply prevent retraction of a burner when alight. Air supply to the burner is automatically put on or shut off by rotation of the burner, obviating the need for individual dampers.

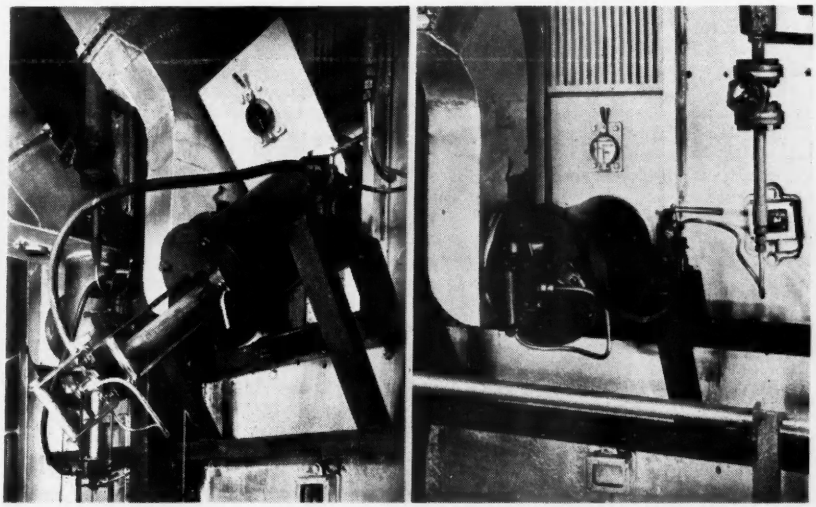


Oil pumping and heating plant

The four boilers that are fitted with initiators are rated at 50,000 to 55,000 lb/hr with steam conditions of 220 lb/sq in and 660 and 695 deg F. Three employ the bin and feeder system of pulverized fuel firing and one the unit system. Four initiators are fitted to one boiler, three to two boilers and two to the fourth boiler.

Heavy fuel oil of 960 sec. Redwood No. 1 viscosity is supplied by Charrington, Gardner & Locket (London), Ltd., by road tanker and is delivered at 100 deg F into two tanks of 30 tons total capacity, in which the temperature is maintained at the same figure by steam coils. It is drawn thence by two positive displacement pumps which deliver it to a looped oil range at 200 lb/sq in and is fed to the burners at 200 deg F through thermostatically controlled electric heaters.

An initiator entering the furnace and (right) in operation



As a result of the installation of oil burning equipment the emission of smoke and grit from the chimney has notably improved. This claim is supported by outside observers interested in smoke abatement. The station staff agrees that the increase in furnace temperature from 2,300 to 2,600 deg F has given more complete combustion with a consequent reduction of carbon-in-grit carry-over and higher combustion efficiency which, however, cannot be expressed in figures in view of other improvements which have recently been made.

Pressure raising by oil has resulted in more even heating owing to the use of three or four burners across the boiler instead of lighting up by one p.f. burner only. Other advantages noticed are a reduction in overheating of superheater tubes and a finer control of superheater and furnace temperatures, a much more rapid air heating and a most useful method of drying coal ready for use in the bins. The higher furnace temperatures have so far not adversely affected the furnace refractories and the expected increase in fuel costs per kWh sent out has not been experienced in practice.

The output capacity of the station immediately after annual overhaul of the plant without the use of oil was 24,000 kW. With oil boosting the capacity has been raised to 27,000 kW, an additional 3,000 kW having been obtained for a capital expenditure of approximately £2 per kW sent out.

Spreader Stokers

EXPERIENCE of spreader firing in this country and in Australia was described to the Institute of Fuel on 24th March by Messrs. T. H. Lindsay and P. Pilkington (Babcock & Wilcox). The authors first referred to the 40,000 lb/hr pilot plant commissioned at Renfrew in 1946 and then dealt with the performances of the spreader stokers brought into service at the Kearsley (1949) and Staythorpe (1950) B.E.A. power stations, at Guest, Keen and Nettlefolds' works and at Osborne " B " power station and Maryvale (paper-making) in South Australia. They produced evidence of the ability of these stokers to operate successfully over a very wide range of low-grade coals and to follow changes in fuel quality immediately (in contrast to the four or five hours needed to restore efficient combustion on chain-grate or travelling-grate stokers after each change of fuel.

Easy to light up and bring up to pressure, they could be banked with low fuel consumption; they quickly responded to load variations, and their availability in relation to exterior deposit formations was at least equal to that of chain grates.

The spreader unit comprised a reciprocating feeder plate, regulating the rate of fuel supply, which was distributed over the grates by a rotor having two rows of blades; laterally by the curve of the blades and longitudinally by control of the rotor speed or the spill-plate setting.

The largest unit yet constructed anywhere was rated at 264,000 lb/hr (Elsinore). In first cost a spreader stoker was comparable with an ordinary stoker and the cost was considerably less than for powdered-fuel firing. A similar comparison obtained regarding power for auxiliaries. Coal should have an upper size limit of 1¼in, but generally ¾in or ½in to zero gave best results, with at least 25 per cent over ¼in and 50 per cent under ⅛in; the low limit of volatile matter (dry ash-free basis) was 20 per cent and the upper ash limit (dry) 30 per cent.

Initial troubles with the eight 160,000 lb/hr Kearsley boilers (620 lb/sq in and 820 deg F) and the ten 240,000 lb/hr Staythorpe boilers (950 lb/sq in and 925 deg F) were described, with the steps taken to remove the causes. One modified Staythorpe unit using coal with 0·25 to 0·30 per cent chlorine when examined after 3,700 hours showed that the run could have been considerably prolonged.

The seven 150,000 lb/hr boilers at Osborne " B " were designed to burn eisher N.S.W. bituminous coal or local Leigh Creek brown coal of 6,170 B.Th.U./lb gross calorific value.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Battery Vehicle Parking Brake

THE "Electropark" brake has been designed by SMITH'S ELECTRIC VEHICLES, LTD., Princes Way, Team Valley, Gateshead-on-Tyne, 11, to provide an additional safeguard for "NCB Electric" vehicles when stationary or left unattended for short periods. At such times the vehicles depend for their safety on the handbrake, and the "Electropark" enables a driver to lock the four-wheel hydraulic brakes "on," in addition to applying the handbrake.

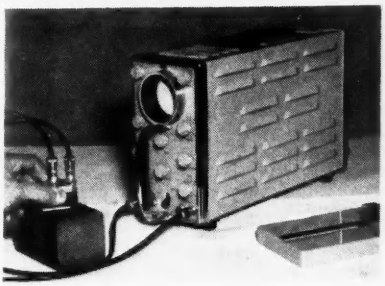
The device consists of an electrically operated valve, which is connected in the brake pipeline from the master cylinder so that, when the valve is closed after the brakes have been applied by the brake pedal, the fluid in the wheel cylinders is kept under pressure and the brakes held "on" on all four wheels, with the brake pedal released.

The valve is controlled by a toggle switch, mounted on a small control box, together with a red indicating light, wired ready for installation on the vehicle. The electrical circuit of the valve is so interlocked with the controller that the vehicle cannot be started with the brakes on. The valve is supplied complete with all the necessary fittings and wiring, and is readily mounted in an accessible position under the driver's seat, on the riser panel.

Supersonic Flaw Detector

A supersonic flaw detector to be known as the Mk. 5 has been designed by KELVIN & HUGHES (INDUSTRIAL), LTD., 2, Caxton Street, London, S.W.1, for the inspection of welded pressure vessels where the equipment must be passed through a manhole. The equipment, which is self-contained, measures 17in by 9in by 5in and weighs less than 30 lb. A feature of the instrument is that the scale can be expanded so that the width of the screen represents only a small part of the total range, thus facilitating thickness measurement or the individual detection of closely grouped flaws. A very bright trace even on the shortest range is achieved and is adequate for daylight viewing. The instrument uses the lightweight leads and can be operated with the full range of Kelvin Hughes probes. A special combined transceiver probe affords many of the advantages of the dual probe system while allowing the ease of handling inherent in a single probe. The coaxial sockets are duplicated to allow for use of special filters on a depth and thickness gauge. The standard model operates from 200/250 V 50 c/s mains, but other voltage ranges can be supplied on special order.

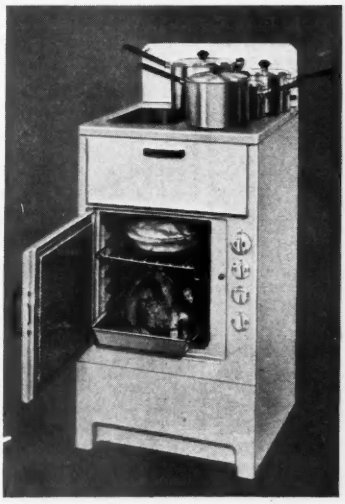
Kelvin Hughes Mk. 5 supersonic flaw detector and combined transceiver probe



Three-Plate Cooker

A three-plate cooker introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, meets the requirements of a family of eight persons is pleasing

Plinth model (DC 753) of the new G.E.C. cooker



in appearance and has an easy-to-clean, acid resisting porcelain enamel finish. The oven, large enough to hold a 21 lb turkey, is fitted with panel elements designed to combine efficient heat distribution with economy in electricity consumption. It has a side opening door and is fitted with "Ovenmaster" automatic temperature control. The oven interior is removable in three pieces.

The hob equipment comprises one 8in and one 6¼in boiling plate, and a 10½in by 8in grill boiler. Three-heat control is normally provided but simmer control is available for the 8in plate as an extra.

The cooker is available either on legs (DC 752) for £28 or on a plinth (DC 753) for £29. The standard colour is mottled silver grey but, if desired, the plinth model is also available in green and cream or in two-tone ivory at a slight extra charge. Overall dimensions of the cooker (including splashguard) are 21in wide, 19in deep and 43⅜in high. Net oven space is 12⅞in wide by 16¾in deep by 13¼in high. Warming cupboard space is 17⅜in wide by 15⅜in deep by 6in high. The total loading is 7,300 W.

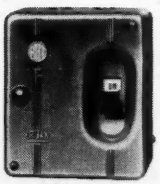
Switch-Fuses and Switch Splitters

The latest addition to the range of "Crown" switch-fuses and switch splitters made by BILL SWITCHGEAR, LTD., Aston Lane, Perry Barr, Birmingham, 20, is a 30 A double-pole pilot switch and a 15 A single-pole and neutral pilot switch-fuse, both being in metal cases.

Compact Limit Switch

The "Crader" Type V limit switch made by CRAIG & DERRICOTT, LTD., Coleshill Street, Sutton Coldfield, measures only 5⅜in by 1⅜in by 1⅝in. It is rated at 5 A, 250 V or 2 A, 500 V, and incorporates a simple and effective slow break action with silver butt contacts. Ample room is provided for wiring.

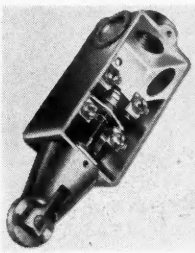
Three sequences are available: normally closed, normally open and normally closed and normally open. Models for roller or plain plunger operation can be provided; the latter type can be dust- and drip-proof with rubber plunger bellows and sealed lid if required. With plain spindle, a normally open or normally closed unit costs 36s, a normally closed and normally open type costing 39s. Roller spindle models are 4s 6d extra.

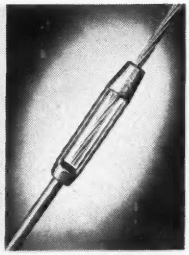


Left: **"Crown" pilot switch (Bill Switchgear, Ltd.)**

Below left: **"Crader" limit switch with roller spindle, arranged for normally closed and normally open sequence**

Below right: **Cable Covers stay rod**

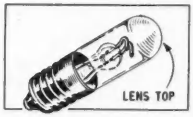




Neon Indicator Lamps

The latest addition to the range of neon indicator lamps available from NEOFLEX, LTD., Lye Green Road, Chesham, Bucks, is a miniature tubular lamp which can be supplied either with an m.e.s. or m.c.c. cap. The feature of this lamp is the hook shaped electrodes, which combined with a lens integral with the lamp envelope ensure a brilliant light from all angles. This type of lamp has previously only been readily available from the United States and Germany. Another lamp, but with straight electrodes and no lens, is designed for fitting into fuse holders, etc.

Neoflex hooked electrode neon indicator lamp



Stay Rod

The new type of stay rod which has been introduced by CABLE COVERS, LTD., St. Stephen's House, London, S.W.1, is inexpensive, speeds up erection, eliminates splicing and economizes in stay wire. As can be seen from the accompanying illustration, the stay wire is inserted through the top of the drop forged head for the full length of the slot while under tension. Cones are then inserted and the tension released, thus completing the operation. The ultimate tensile strength of the rod complies with B.S.1320 : 1946 and is available complete with 4in by 4in (or 6in by 6in) by 0·25in base plate, nut and lock nut suitable for use with 7/14, 7/12, 4/8, 7/10 or 7/8 s.w.g. stay wire.

Suspension of N.Z. Restrictions

FROM 1st April allocations of electric power to supply authorities in the North Island of New Zealand will be suspended until further notice. The Minister in charge of the State Hydro-electric Department, the Hon. W. S. Goosman, said that the improvement in North Island water storage, and the bringing into operation of the new generating station at Maraetai had made this possible.

COMMERCE and INDUSTRY

Import Licensing Changes

Electrical Grass Drying Experiments

NOTICE to Importers No. 546 issued by the Board of Trade adds switches to the list of electrical goods (Group 12) included in Notice No. 492 which announced the issue of an open general import licence. Electric typewriters are added to Group 8. The item "electric machinery" in Group 8 has been amended to read "Electric machinery, the following:—Converting machinery, generators, motors, rectifiers, starting and control gear for electric motors, switchboards, switchgear, transformers."

Import quotas for the period 1st July to 31st December this year are given in Notice No. 547. The value fixed for electrical appliances and apparatus, other than lamps and lighting appliances, is £50,000 and that for electric lighting appliances, £82,000. Illuminating glassware of all kinds is included in a comprehensive range of glassware for which the quota value has been fixed at £420,000.

Copper Price Reduced

The Ministry of Materials announces that the price of electrolytic copper has been reduced from £285 to £280 per ton delivered consumers' works. At the same time the discount on Ministry sales of blister copper is increased from £5 to £6 17s 6d. Other discounts and premiums remain unchanged.

Bolt and Nut Prices

The Minister of Supply has made the Bolts, Nuts, etc., Prices (Revocation) Order, 1953, S.I. 1953 No. 478 (H.M. Stationery Office, price 2d), terminating with effect from 23rd March the statutory control of maximum prices for steel bolts, nuts, screws and rivets. The manufacturers concerned intend to revise their prices. The prices of the majority of these products will be reduced or remain stationary, while the prices of some will be increased. The overall effect will be a net saving to consumers of approximately £250,000 per annum.

Hundred Per Cent Purchase Tax

Replying to Sir Edward Boyle in the House of Commons last week, Mr. Boyd Carpenter detailed the main categories of goods now subject to purchase tax at the rate of 100 per cent and gave the estimated yield of tax from these categories in 1950–51 and 1951–52. Included in the list were "Domestic electric water heating and certain electric space heating appliances," the tax on which yielded £2·82 million in 1950–51 and £3·05 million in 1951–52.

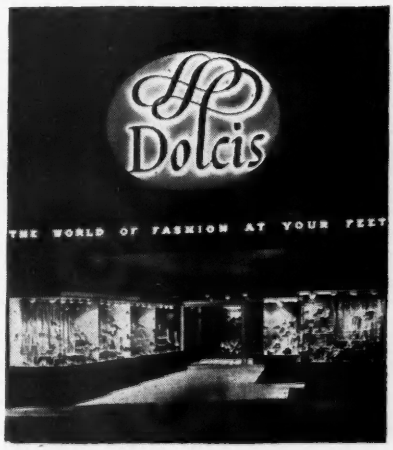
Women in Management

The Institute of Industrial Supervisors is holding a week-end residential course for women in management on "The Practice of Supervisory Management," from 8th to 10th May at Dillington House, Ilminster, Somerset. The course will be conducted by Mr. D. H. Bramley, head of the Department of Industrial Administration, College of Technology, Birmingham.

Canadian Store Lighting

The accompanying picture shows a facia sign recently supplied to the Dolcis Shoe Co. for its branch in Toronto. The new type of lettering recently standardized by Dolcis represents considerable lighting problems, and in this case it was decided to employ an oval background panel, 13ft 6in long and 10ft 6in high, consisting of two sheets of ¼in plate glass with a plyglass diffusing panel in between. This panel, when completed, weighed approximately

Facia sign at the Toronto Branch of the Dolcis Shoe Co.



half a ton. The lettering " Dolcis " is built up from sheet metal and the illumination is provided by neon tubes fitted behind the glass. When the sign was erected a large crane was used and the traffic in the main street of Toronto was stopped while the sign was hoisted into position. The new Dolcis shop in London, Ontario, is being similarly equipped. The sign was designed by Mr. E. E. Somake, F.R.I.B.A., staff architect to Dolcis, who supervised the erection of the sign which was manufactured by Courtney, Pope (Electrical), Ltd.

Ionization Conference

A conference on ionization phenomena in discharges is to be held at Oxford from 18th to 23rd July jointly by the Clarendon Laboratory, the Institute of Physics, the Physical Society and the Electrical Research Association. The main subjects will be the manner in which glow discharges take place, sparks and arcs, electrodeless discharges, Geiger counters, photo-ionization processes and ionization by electron collision in gases. One session will be reserved for questions of general interest and there will be visits to laboratories, social meetings and excursions.

R.I.C. Resistor Specification

The first and second sections of specification RIC/121 for resistors of the rotary, variable, wire-wound type are now available. This specification has been produced by agreement between B.R.E.M.A., R.C.E.E.A. and R.E.C.M.F., whose individual contributions to the substance of the document have been co-ordinated and edited by the Technical Specification Committee of the Radio Industry Council and have been authorized for publication by the Technical Directive Board of R.I.C. on which all the constituent associations of the latter are represented.

For the time being this specification is meant for use internally within the industry, but it is intended to submit it in due course to the British Standards Institution and it is hoped that, by that time, it may have been possible to co-ordinate the respective requirements of the industry and the Services for these components in comprehensive national standards.

Copies of Sections 1 and 2 (together) of this specification may be obtained at a charge of 5s a copy, post free, from the Radio Industry Council, 59, Russell Square, London, W.C.1.

Power Station Overtime Ban

Craftsmen employed at the Dunston-on-Tyne, Wallsend and South Shields power stations have decided to maintain their ban on overtime as a protest against the meagre difference in their wages and those of unskilled men. About 100 men are involved, but so far the ban has not unduly interfered with the work at the power stations. In some cases, it is alleged, stokers employed at the power stations can obtain 1½d an hour more than skilled men. The British Electricity Authority has pointed out that wage rates were settled nationally between the B.E.A. and the Amalgamated Engineering Union. The Tyne and District Committee of the A.E.U. is, however, supporting the men's overtime ban.

Coronation Calendar

An excellent portrait of the Queen (by Dorothy Wilding) is reproduced on a Coronation calendar (April, 1953, to March, 1954) which we have received from the Metropolitan-Vickers Electrical Co., Ltd.

Electric Ship Propulsion

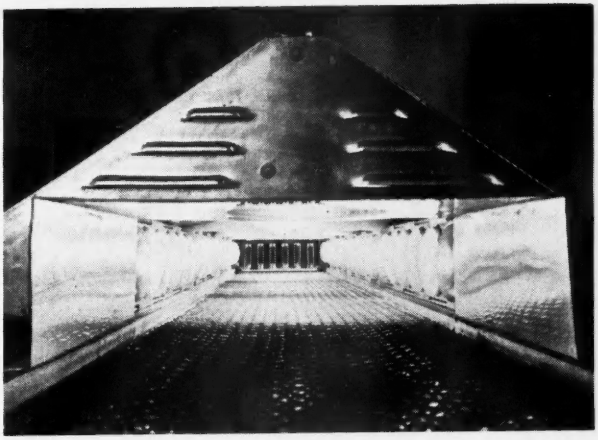
The accompanying photograph was taken recently when the 8,300 s.h.p. 103 r.p.m. propeller motor for the 18,000 ton (d.w.) tanker T.E.S. *Helix* was dispatched recently from the Rugby works of the British Thomson-Houston Co., Ltd. As shipped, less air coolers, trunking, and ventilating fans, the motor weighed 100 tons with overall (out-of-gauge) dimensions of 16ft 6in wide, 15ft high, and 21ft long. The ship, the first of two tankers ordered by the Anglo-Saxon Petroleum Co., Ltd., from Swan, Hunter & Wigham Richardson, Ltd., was

A large propeller motor being dispatched from the B.T.H. Rugby Works

launched on 16th January. Two similar tankers are being built by Wilton-Fijenoord N.V. in Holland. All the four ships will have identical B.T.H. machinery comprising the 7,500 s.h.p. (8,300 s.h.p. max.) turbo-electric propulsion equipment; two 700kW (870 kW max.) geared turbo-alternator/exciter sets; auxiliary motors and associated control gear; and switchboards.

Batti-Wallahs' Society

The speaker at last week's luncheon of the Batti-Wallahs' Society was Capt. J. Summers, formerly chief test pilot with Vickers-Armstrong's Aviation Division, who spoke on the rapid developments in the design of aircraft for war and peace. The high speeds of modern aircraft had had the effect of bringing the peoples of the world closer together and it could thus be an important factor in bringing about world peace.



Mass drying of painted torch cases in the first infra-red oven to be used in Hong Kong

Infra-red Plant in Hong Kong

The first infra-red plant for use in Hong Kong has recently been made up from infra-red reflector units supplied by the British General Electric Co., Ltd., representing the G.E.C. in Hong Kong, to the Cheong Kong Electro-plating Works, a subsidiary of the Honor Metal Manufacturing Co., which manufactures electric torches. At these works torch cases are plated and painted black, red, blue or green, and the new plant will be used to dry paint on finished cases.

The equipment consists of twelve 3ft six-lamp infra-red reflector units, divided into three groups of four reflectors. Two groups of reflectors are placed at either side of a conveyor, which is a continuous mesh belt running over two 12in diameter drums, the third group being centrally placed above it. The lamp units are mounted on sheets of polished aluminium and with the mesh conveyor form an enclosed whole. An outer cover of sheet metal serves as an exhaust ducting and there is an enclosed extension of polished aluminium one-and-a-half feet in length, at each end of the oven.

The oven is divided into four sections, each of which has two switches, one controlling the side lamps and the other controlling the overhead lamps. Owing to the voltage supply in Hong Kong (346/200 V), three lamps are connected in series across the outers. The continuous mesh belt has a maximum speed of 12ft in 20 minutes and a minimum speed of 3ft in 20 minutes. Intermediate speeds are obtained through gear box or vee pulleys. The capacity of the oven is such that, using only two-thirds of the lamps, with an approximate loading of 12 kW, 1,260 torch cases can be dried every hour.

Dynamometer Contract

Heenan & Froude, Ltd., Worcester, have received a contract from F. Perkins, Ltd., Peterborough, for two electric dynamometers for their Experimental Department. One of these is a high-speed machine of small capacity; the other is of 180 b.h.p. and incorporates the Heenan patented system of controlled regeneration.

Grass Drying in Scotland

In the House of Commons last week Mr. Grimond asked the Secretary of State for Scotland what experiments had been carried out in the drying of grass by electricity; how far these had proved successful and economic; and what steps were being taken to make facilities available to small farmers and crofters.

Mr. Stuart said that for several years the North of Scotland Hydro-Electric Board had conducted experiments in the drying of hay and grass, of which details were given in its report for 1952. He understood that additional plants were being provided this year and that it was proposed to experiment with a plant at Plockton which could be used by small farmers and crofters on a community basis. The

process was, however, still in the development stage

Cable Makers' Wages

The Joint Industrial Council for the Electrical Cablemaking Industry has decided that men employed in oil bays where the jointing of oil-filled cables is being carried out shall receive an additional allowance of 3s for a working day of any length without any extension in respect of overtime.

Aerialite Newcastle Branch

The new branch of Aerialite, Ltd., at 46, Leazes Park Road, Newcastle-on-Tyne, 2, was formally opened on 16th March. Among those who attended were Mr. H. Haigh and Mr. Umpleby of the North Eastern Electricity Board and a number of trade representatives. The inspection of the premises was preceded by a lunch at Tilley's Restaurant. After the luncheon Mr. P. Jones gave a lecture which was repeated again in the evening at the Station Hotel, when all television dealers were invited. The manager of the branch is Mr. G. T. Hickling.

Central Heating

The Council for Codes of Practice for Buildings has issued, as a draft for comment, Code 341.300 on central heating by low pressure hot water, which comprises a head-code and seven sub-codes incorporated in one document, the sub-codes having the following titles: boilers and calorifiers; storage vessels; pipework, fittings, valves and cocks; appliances (column radiators, surface panels, convectors); unit heaters; power driven circulating pumps for l.p. hot water heating installations; and thermal insulation.

The Code is in draft form and is subject to amendment should comments be submitted by 15th April, 1953. Copies may be obtained from the British Standards Institution, 24, Victoria Street, London, S.W.1, price 15s, post free, reference CP (B) 1107.

North London Exhibition

The first post-war North London Exhibition will be held at Alexandra Palace from 15th to 25th April.

Trade Announcements

The directors of **Metalastik, Ltd.**, announce that an agreement has been concluded with the Italian Pirelli concern, which provides for an exchange of patents as well as technical and commercial co-operation for the manufacture of rubber-to-metal bonded components.

Switchgear & Equipment, Ltd., moved their London office on 25th March to National Bank House, 101-103, Baker Street, W.1 (telephone : Welbeck 5969).

Hirst, Ibbetson & Taylor, Ltd., have appointed Mr. J. Demaine, 23, Highfield Road, Earby, Colne, to represent them in North East Lancashire, Mr. J. K. Hagan, 128, Kearsley Road, Higher Crumpsall, Manchester, to cover South East Lancashire, and Mr. A. Riste, a member of their inside staff, to cover greater Manchester.

The **Aberdare Electric Co., Ltd.**, informs us that in future all its business in the British Isles will be under the sole control of Thermodare (Great Britain), 36, Victoria Street, London, S.W.1. (telephone : Abbey 1060). A 2,000 W Thermodare storage space heater (size as 1,500 W model) has been introduced, at £15, in addition to the existing 1,000 W and 1,500 W models.

Catalogues and Lists

Thorn Electrical Industries, Ltd., 105, Judd Street, London, W.C.1.—Illustrated priced folder relating to the Mary Ann " Doubleway " electric iron.

Dowty Seals, Ltd., Ashchurch, Nr. Tewkesbury, Glos.—Leaflets and catalogues giving details of the company's standard range of rubber gland rings, washers and other products.

Watertight Fittings, Ltd., Victory Works, 4-10, Newbold Road, Chesterfield.—Priced leaflet illustrating the " Everyman's " floodlight fittings (O61C).

Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4.—Publication 9701 relating to rotary dryers and coolers.

Stage Electrical Equipment, Ltd., 138, Wardour Street, London, W.1.—40-page priced catalogue of stage lighting equipment and control gear containing details of the " Miniseel " remote control stage switchboard.

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—52-page catalogue describing an all-insulated industrial wiring system, and accessories (323).

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—Priced folder illustrating " Mazda " coloured lamps and floodlights.

George Turnock, Ltd., Tunion Works, Navigation Street, Walsall.—Illustrated priced folder of "Tunion" illumination lampholders.

Teddington Engineering Co., Ltd., 29-31, High Street, Teddington, Middlesex.—Descriptive leaflet on the Johnson " Chorehorse " generating sets.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—Illustrated catalogue of " Sieray " fluorescent lighting fittings and equipment together with price list (1020).

Electricity in Falmouth Dockyard

Plans for Change-Over to Mains Supply

FALMOUTH, Cornwall, has been a centre for ship repairing since the days of the old wooden sailing ships. The dockyard has used electricity for over 30 years, the first supply being provided by a 160 kW steam generating set in 1916, which was replaced in 1921 by two Allen 500 kW d.c. turbo-generators. When these were installed, there were two wharves in the wet dock as well as three dry docks. Later a fourth graving dock was constructed together with four new wharves, and the most recent addition has been a large floating dock.

Extensive Repair Work

As the dockyard facilities and power requirements increased, two Polar Atlas diesels with B.T.H. generators were installed, bringing the output of the 500 V d.c. system up to 2,200 kW. The volume of repair work and refitting of vessels has grown steadily over the years, until to-day Falmouth has become the major yard in the country for the repair of ships. Since the d.c. generating station began operating, the demand for power has trebled and is still rising, the annual consumption now being nearly 3·5 million kWh.

The Central Cornwall District of the South Western Electricity Board (manager, Mr. J. W. Roberts, A.M.I.E.E.; engineer, Mr. E. W. A. Edmonds, A.M.I.E.E.) is engaged in a large development scheme to provide a mains supply which will eventually replace the existing d.c. system. The Board is taking an 11 kV supply from its substation near Penryn direct to the docks by means of 1,150 yd of 0·15 sq in copper overhead line and 3,040 yd of three-core 0·2 sq in armoured underground cable. The work is being carried out by Cornwall Sub-Area gangs under Mr. B. O. Rees (Sub-Area construction engineer).

The 11 kV cable will feed into a substation just inside the dockyard entrance, where the supply will be metered, and Silley, Cox & Co. (electrical manager, Mr. W. J. Sparey, M.B.E.), who operate the dockyard, are having a ring main and eight other substations built to distribute the energy at high voltage and to supply the dry docks, wharves and workshops. Several miles of cable are being laid in the dockyard to provide all the services needed (there are about 500 motors in use, ranging from fractional h.p. up to 90 h.p.). The h.v. and l.v. switchgear is provided by Metropolitan-Vickers (Type K.O.B.2) and there will be three banks of Electric Construction six-phase rectifiers to enable the existing d.c. equipment to be used.

A h.v. supply is also being taken directly to the dockyard operators' floating dock. This dock, which lifts 10,000 tons and is 600ft long and 65ft in beam, provides a load of 600 kW and is at present supplied by an independent diesel alternator. It was, however, already equipped with a transformer to take a shore supply at 6 kV and has now been modified to take the Board's 11 kV supply.

New Wharves

Two new wharves each about 700ft long, are being constructed on the western side of the dock, and within the next two years they will provide facilities for the refitting of passenger vessels. Each will be equipped with a 200 h.p. 25 ton mono-tower crane taking a 440 V a.c. supply.

The largest power consumers on the docks are the four main pumps, with a total of more than 1,300 h.p., used for dewatering the four dry docks, whose sizes range from 537ft to 750ft long with a beam of 85ft.

All the machinery in the numerous dockyard workshops—including the foundry, platers', blacksmiths', joiners' and pattern shops—is electrically driven, and many of the tankers which use the docks are electrically propelled. In dock the tankers are given a shore supply to operate their auxiliary services aboard and each vessel's three 50 h.p. cargo pumps and two stripping pumps of about 25 h.p. One vessel in dock may set up an immediate demand of

120 kW for pumping oil cargo, lighting, cooking, heating and other services.

The dockyard's floodlighting system ensures safe and accurate working after dark. There are about sixty Holophane 1,000 W projector lamps mounted on 50ft standards in the dockyard and along the wharves, supplemented by about 20 Metropolitan-Vickers lanterns on 25ft standards.

Although Falmouth is largely a repair dockyard, cargoes of oil are received at the docks. These are discharged at the Eastern breakwater either to the oil storage base on the docks or direct to oil company depots. With the increase in tanker tonnage in the post-war years the dockyard seems assured of a busy period ahead, and when the full electrical development scheme is completed in the next two years the demand is expected to exceed 4,000 kW.

B.I.C.C. IN CANADA

BRITISH Insulated Callender's Cables, Ltd., has acquired, as from 30th April, the cable and wire business of Phillips Electrical Works, Ltd., Canada, and, through a new Canadian company, Phillips Electrical Co. (1953), Ltd., will carry on this business as a going concern at the existing Brockville (Ontario) and Montreal factories. The people engaged in the acquired business will be retained.

To ensure the continuance of supplies and services to customers, sales will continue to be made for the time being through Automatic Electric (Canada), Ltd., Toronto, but the intention is that the new company will undertake its own direct selling and servicing. During this interim period Automatic Electric (Canada) will also continue to sell in Canada those special types of B.I.C.C. cables and other products not manufactured by Phillips, but this agency will also in due course be taken over by the new company. The chairman of the company will be Mr. W. H. McFadzean, C.A. (deputy chairman and chief executive, British Insulated Callender's Cables, Ltd.), and the vice-chairman Mr. A. D. Torrey (president of W. C. Pitfield & Co., Ltd.). The other members of the board will be Mr. H. F. Akehurst, B.Sc., A.M.I.E.E. (chairman, British Insulated Callender's (Export), Ltd.), Mr. T. W. Brackinreid, B.A.Sc., P.Eng., M.E.I.C. (president), at present president of Phillips Electrical Works, Ltd., Mr. T. A. Lindsay, B.Sc., P.Eng., M.E.I.C. (executive vice-president in charge of sales), at present vice-president and general manager of Automatic Electric (Canada), Ltd., Mr. J. R. Philips, C.A. (executive vice-president in charge of operations), at present vice-president and general manager of Phillips Electrical Works, Ltd., and Mr. H. D. Scully, director, International Business Machines Co., Ltd., etc.

According to the *Financial Times* a syndicate headed by W. C. Pitfield & Co., and including Wood Gundy & Co., Greenshields & Co., and Rene T. Leclerc, will shortly offer $6 million of 5 per cent first mortgage sinking fund bonds, series "A," due 1968, and $3 million of 5½ per cent convertible sinking fund debentures, due 1970. Both the bonds and debentures will be dated 1st April, 1953, and it is expected they will be offered at par, plus accrued interest. The first mortgage bonds will carry a sinking fund sufficient to retire $300,000 annually, commencing 1st April, 1954.

The debentures will be convertible into stock on the following basis per $100 debentures: six and two-thirds shares up to 31st March, 1958; five shares thereafter to 31st March, 1963; and four shares thereafter to 31st March, 1970. B.I.C.C. will invest $3 million in the new company in the form of common stock.

Phillips Electrical Works, Ltd., are among the largest electric cable manufacturers in Canada, their activities including the rolling, drawing and processing of copper and its alloys; the manufacture of paper, rubber, thermoplastic and other insulated wires and cables; telecommunication cables and wires of all types; and enamelled, synthetic and other covered wires.

The entry of the B.I.C.C. Group into the manufacturing field in Canada marks a further step forward in its world-wide development of important manufacturing and other associated interests. The same policy will be followed in Canada as in the case of the other associated companies in that, while the new company will be operated essentially as an independent Canadian concern, the benefits of the research, technical and other resources of the B.I.C.C. Group will be made fully available to the company and its customers.

Estate Supply Terms

The general question of capital contributions towards the cost of electricity supplies to new housing schemes is under discussion between the London Electricity Board and the Standing Joint Committee representing the twenty-eight metropolitan boroughs.

Connaught Bridge Power Station

First Half of 80,000 kW Plant Commissioned in Malaya

THE Connaught Bridge power station near Kuala Lumpur, the capital of the Federation of Malaya, which has just been officially opened, is the main initial source of energy for the Malayan grid system. Plans for the construction of the station, which is to have an ultimate capacity of 80,000 kW, were made by the former Government Electricity Department, predecessor of the present Central Electricity Board, the services of Messrs. Preece, Cardew & Rider being retained as consulting mechanical and electrical engineers, and those of Messrs. Coode & Partners as consulting civil engineers.

The river site is two miles east of Klang at Selangor and about eight miles by road or rail from Port Swettenham. The distance is short enough to make a pipeline economical for the conveyance of fuel oil from that port, and the station is within reasonable rail distance of the colliery at Batu Arang. The ground is good, though piled foundations were necessary; a total of 126 acres of land was acquired, including a swamp area for ash dumping and a hill for development into a housing estate for the station staff.

Preliminary work on the site commenced early in 1949 and permanent work in April, 1949, culminating to-day in the completion of more than half of the civil works and the commissioning of half of the generating plant while by 1955, it is anticipated, a further 40,000 kW will be available.

This power station will be interconnected with the Board's thermal station at Bungsar, Kuala Lumpur, and the hydro-electric stations at Ulu Langat. The three will give bulk supplies throughout Selangor to some areas of Negri Sembilan, including the towns of Seremban and Port Dickson, and throughout the Settlement of Malacca.

The station with its associated transmission lines, substations, bulk fuel oil and coal handling facilities and housing will represent an investment of approximately $60 million. Excluding the cost of housing, transmission lines and the Bungsar substations, the cost per kW of plant installed will amount to about $625. To reduce

Connaught Bridge power station on Klang river in Selangor, Malaya, showing oil fuel settling tanks (*centre*) **and pumphouse** (*right*) **with trusses of new Bailey bridge to the left**

personal fatigue almost all the plant has been disposed on the ground and first floors, while all floors will be served by passenger lifts. The circulating water pumps are installed in a pumphouse of monolithic concrete construction sited in the river and joined to the bank by a reinforced concrete viaduct supporting the main circulating water pipes and access bridge.

Consideration had to be given to the fact that only one coal mine existed in Malaya, and it would have been unwise to rely entirely upon the use of local coal. Of alternative imported fuels, boiler oil was likely to prove the most convenient to handle and store. Therefore, while plant and facilities for burning either local or imported coal were available, it was decided to provide in addition facilities for handling, storing and burning boiler oil. This decision increased the capital cost of the station by approximately $3 million, but it places the Board in a favourable position in that it may take the fullest advantage of any changes in the price or availability of the alternative fuels. At present it is more economical to use imported oil fuel than either local or imported coal; but, whatever happens, the dual fuelling arrangements will permit the burning of any or each of the three fuels either singly or in combination.

Oil-Handling Arrangements

The scheme embodies the delivery of fuel oil to Port Swettenham by seagoing tankers, pumping from the vessels to the Board's storage tanks, transfer to Connaught Bridge for storage or daily consumption, and transfer at Connaught Bridge into rail wagons for use at the Bungsar power station, Kuala Lumpur. Oil is pumped daily to Connaught Bridge, a distance of 7¼ miles, by high pressure transfer pumps direct to the boiler house daily service tanks, to rail wagons, or to storage.

The pipeline from the port to the power station is of 8in bore mild steel, both under and over ground. Provision is made for filling at any one time up to 12 rail tank wagons, each of 20 tons capacity, a full train being just more than sufficient to meet the maximum requirements of Bungsar power station.

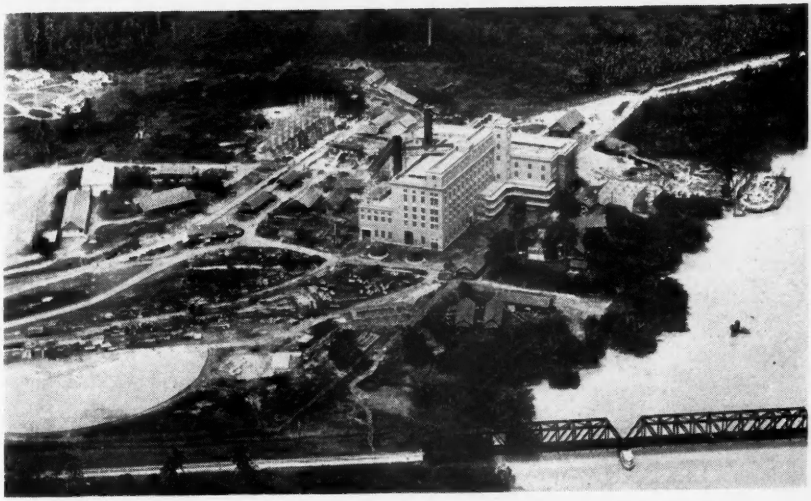
Pumping of oil to tank wagons and service tanks is performed by electrically driven pumps of the rotary screw displacement type. Due to the prevailing temperatures in Malaya, heating of the oil in storage tanks or pipelines will not be necessary.

The steam raising plant for the first half of the power station consists of four water tube boilers, each of 120,000 lb/hr (m.c.r.) with conditions at the superheater outlet of 425 lb/sq in and 825 deg F when provided with feed water at 310 deg F.

The completed station will contain four 20 MW turbo-alternators and a 1,000 kW diesel-alternator house set. Two of the 20 MW sets and the house set comprise the initial installation. Each turbine has oil relay governor gear and a self-contained lubricating system comprising duplicate oil coolers, settling tank, and main, auxiliary and stand-by pumps; the total oil in the system is 2,200 gal. Power driven turning gear, interlocked with a lubricating oil pump, ensures even heating and cooling of the rotor when starting and shutting down.

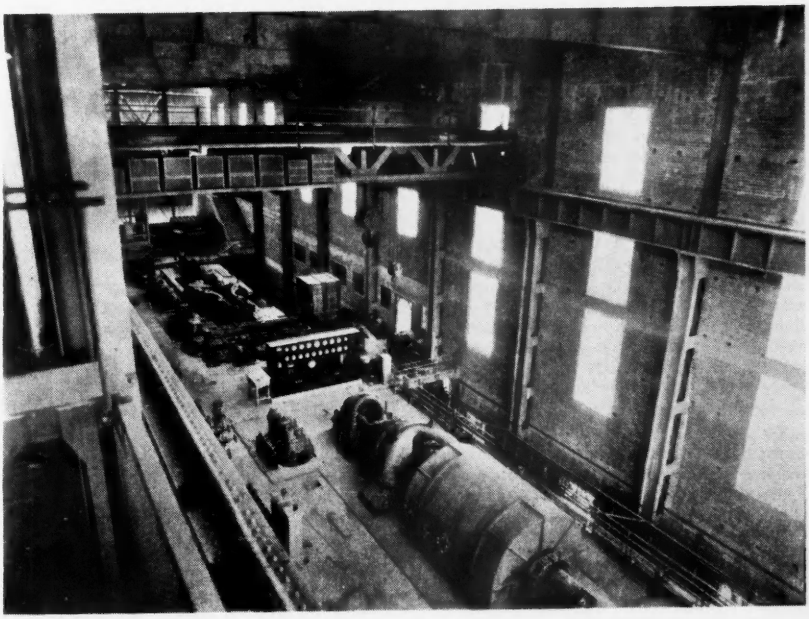
Each alternator has its own forced air cooling system. Separate motor driven fans circulate air through the windings and an air cooler. The air required at full rated output is 45,000 cu ft/min and the air cooler is provided with water from the condenser circulating water supply system. Under normal conditions the air circuit is closed, but arrangement is made for it to operate as an open system in the event of failure of the air cooler. The alternator supplies energy directly, through an oil circuit breaker, to the 3,300 V station auxiliary busbars. The condensers are of the two-pass type. Duplicate full duty steam operated air ejectors and electrically driven condensate extraction pumps of the vertical spindle pattern are fitted for each condenser.

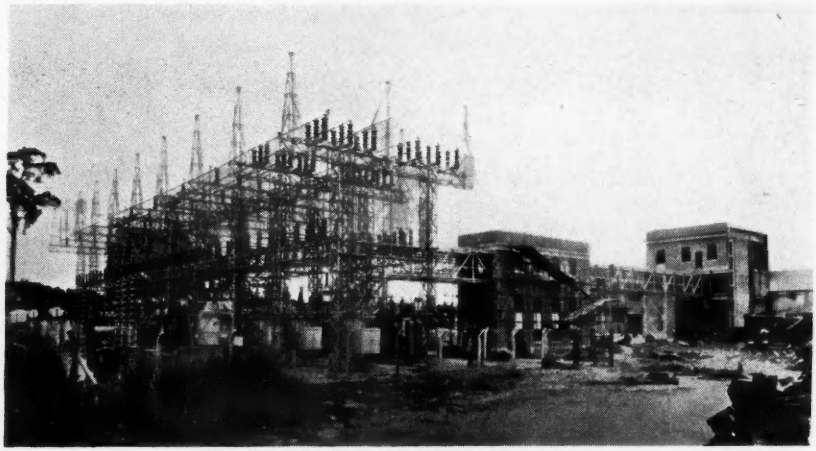
Condensing water is drawn from and returned to the Klang river, which is subject to an appreciable tidal variation at Connaught (railway) Bridge. The circulating water pumphouse was, therefore, built in the river itself, with the intakes on the midstream side, with coarse bar and travelling band screens. The pumps discharge into a 42in bore cast iron manifold which incorporates an arrangement of isolating and cross connecting valves which allow any pump to deliver water to any condenser. All the valves in this system from the pump suctions to the river outlets are electrically operated by remote control from master stations. By using individual inlet and outlet water mains to and from each condenser, water velocities can be



Aerial view of first half of Connaught Bridge power station now in commercial operation

Plant progress view showing one 20 MW set completed and another being assembled





General view of 66 kV outdoor substation

maintained above a value at which settlement of suspended solids is likely to occur. With the exception of " specials " and the cast iron sections carried by a viaduct connecting the pumphouse to the river bank, all circulating water pipes outside the station are of 42in bore spun reinforced concrete and were locally manufactured.

The condensate from the turbines is passed through a bled steam feed water heating system, steam being extracted from four points on each turbine, and the condensate is, under full load, raised to 310 deg F. Associated with each turbine is a bled steam evaporator of town water for boiler make-up feed.

Three electrically and one steam turbine driven boiler feed pumps are provided for the first section. The pumps are of the horizontal, sectional casing, multi-stage turbine type. They are installed at ground level in the feed pump bay. The electric pumps are driven at 1,500 r.p.m. by 3,300 b.h.p. induction motors, which are started by direct switching on to the 3,300 V auxiliary station busbars. The steam pump is driven at 3,600 r.p.m. by a turbine which exhausts to atmosphere. This unit, for emergency use, comes into operation automatically when the feed water pressure falls below a predetermined minimum.

Restricted town water (P.W.D. supply) at varying pressure made it necessary to investigate the possibilities of using the Klang river for part of the station water services. The river is tidal, so frequently saline, but for a restricted period of the ebb tide it is possible to draw off a salt-free and reasonably suitable water for certain station services. It was, therefore, decided to restrict the use of the town water to domestic and boiler feed make-up requirements while the balance would be met by using the river water.

An electric overhead travelling crane capable of lifting 75 tons on the main hook, and 7·5 tons on the auxiliary hook, is provided in the turbine room. The power station workshop is separate from, but adjacent to, the main building; it is fully equipped.

The turbo-alternators generate at 11 kV and each is connected to a transformer which raises the voltage to 66 kV. These transformers, together with auxiliary transformers and certain other lower voltage feeder transformers, are all of the outdoor type and are installed in a 66 kV substation adjacent to the power station.

All main switching is carried out at 66 kV, the switchgear being of the outdoor, solenoid operated, double bus, bulk oil, single tank type with a fault capacity of 750 MVA and operated from, and indicated in, the control room at operating floor level to the north of the turbine room. The control room is built over a cable

flat, where all control and indication cables are marshalled; it also accommodates the remote control panels for essential elements of the power station 3·3 kV auxiliary switchgear.

Synchronizing for both 66 and 3·3 kV gear is catered for by means of a mobile synchronizing trolley, which is plugged into the appropriate panels.

All main power cables are paper insulated, lead covered and, with the exception of single-core cables, steel wire armoured. The bulk are carried overground on cleats supported by the building structure, or in concrete trenches, but certain runs are laid direct in the ground with waterproof servings and a brass tape to combat the attack of white ants.

A private automatic telephone exchange and call system are provided for intercommunication and an illuminated signal system is also provided.

It is necessary to house the whole of the power station administrative, operation and maintenance staff in close proximity to the station and an estate housing approximately 1,500 people has been built in about sixteen months. The total cost of housing the staff amounts to $2·75 million.

CONTRACTORS

The principal contractors for the station equipment were C. A. Parsons & Co., Ltd., turbo-alternators; Babcock & Wilcox, Ltd., boilers; E. Green & Son, Ltd., economizers; Redpath Brown & Co., Ltd., steelwork; J. Blakeborough & Sons, Ltd., water valves; Dewrance & Co., Ltd., steam valves; Hick, Hargreaves & Co., Ltd., deaerator; Davidson & Co., Ltd., fans; Lancashire Dynamo & Crypto (Mfg.), Ltd., motors; Harland & Wolff, Ltd., diesel alternator; Mather & Platt, Ltd., c.w. pumps and feed pumps; British Thomson-Houston Co., Ltd., synchronous condenser and main and auxiliary switchgear; Siemens Bros. & Co., Ltd., cables; Hackbridge & Hewittic Electric Co., Ltd., and English Electric Co., Ltd., arc suppression coils; General Electric Co., Ltd., lighting and telephones; Chloride Batteries, Ltd., batteries; Whessoe, Ltd., fuel oil tanks; Stothert & Pitt, Ltd., fuel oil pumps; Stewarts & Lloyds, Ltd., fuel pipes; and British Insulated Callender's Construction Co., Ltd., transmission line. Other items were supplied by Yorkshire Copper Works, Ltd., Caird & Rayner, Ltd., Ledward & Beckett, Ltd., British Brown Boveri, Ltd., and Brookhirst Switchgear, Ltd.

Consulting Engineers

THE annual dinner of the Association of Consulting Engineers was held at the Dorchester Hotel on 25th March. The chairman of the Association, Sir Bruce White, presided and responded to the toast of "The Association" which had been formally proposed by Mr. A. E. Marples (Parliamentary Secretary, Ministry of Housing and Local Government).

Traditions, Sir Bruce said, were a great asset, but empires could fall because they traded on the past. Consulting engineers originated in Great Britain and had gone overseas to become responsible for schemes there, which had resulted in orders from abroad for manufacturers here. The Association had put before the Board of Trade proposals for the co-operation of consultants, contractors and finance. Different views regarding professional ethics prevailed in Commonwealth countries and it had been necessary to relax the code instituted at home; he personally considered that a similar flexibility should apply to foreign lands also. Harsh taxation was discouraging initiative and enterprise on the part of consultants; it prevented the averaging of good and bad years, the building up of adequate reserves and the making of provision for retirement. Public bodies were somewhat prone to enlargement of staffs beyond the requirements for maintenance, which trenched on the reserves of properly qualified men with a primary training at home who could be sent overseas.

The toast of "The Guests" was proposed by Mr. J. Duvivier (past-chairman, A.C.E.) and replied to by Mr. H. Robertson (president, Royal Institute of British Architects), who referred to the need for co-operation among the various professional organizations. While admitting the need for economy, he urged that it was necessary to explore as well as to carry on. The full use and development of the "know how" was handicapped by the lack of money.

Scottish Railway Electrification

REPRESENTATIVES of the Scottish Council (Development and Industry) and of the Clyde Valley Planning Advisory Committee, at a meeting in Glasgow, decided to make a joint approach to the Secretary of State for Scotland to press for the electrification of the suburban and district railways in Glasgow and the Clyde Valley. Lord Bilsland (Scottish Council) said that the proposals for railway electrification made in the Inglis Report should be dealt with as soon as possible as a major issue.

NEGOTIATION AND CONSULTATION

Procedure in Public Services

A SERIES of meetings organized recently by the Institute of Public Administration has provided an opportunity to examine the techniques of negotiation and consultation in the public services and to compare practices in one with those in others. The services covered were electricity, gas, health, the Civil Service, and local government.

Dr. T. E. Chester drew a distinction between the two functions by saying that negotiation related to the division of the "cake" whereas consultation was concerned with providing a larger one.

There was general agreement that the machinery of joint negotiation represented a vast improvement on the previous lack of system and contributed much to the easy running of the undertakings. In electricity supply, said Mr. R. D. V. Roberts (British Electricity Authority), negotiating machinery now covered the great majority of those employed. It was also generally agreed that however sound the machinery might be at the top there must also be a vigorous system of contact at works level, for the men and women actually on the job, if suitably stimulated, could make the most effective contribution to satisfactory operation.

Mr. R. G. Cook (National Union of General and Municipal Workers), while emphasizing that the essential task of a trade union was to improve wages and conditions, made it clear that there was a large area of common interest between the employing authorities and those who worked for them. The conciliation machinery in electricity, he maintained, worked satisfactorily so that every worker was afforded an opportunity of voicing his grievances and could be sure that they would reach the ear of those competent to remedy them.

But the main ground of common concern appeared to be in the machinery created by the founding statutes to "promote measures affecting the safety, health and welfare" of those in the industry, as well as other matters (widely defined in practice) of common interest to both sides. The contribution thus made to efficiency was stressed by speakers from both sides. No one claimed that they were yet perfect: there were still managers who resented any invasion of their prerogatives and workers who failed to see that they had any interest in the well-being of the industry.

Much had been accomplished by schemes of education and training and by the joint discussion of day-to-day problems, particularly in the works. At first, said Mr. Roberts, the initiative had come entirely from the Authority, but now matters came forward in greater numbers from the other side. Constant improvements were being made in methods of "reporting back" to the workers so that they should have the opportunity of knowing what was going on.

In electricity supply the machinery for negotiation is distinct from that for consultation and there was some discussion of the merits of this arrangement as against that in operation in the gas industry where both functions come within the scope of a single organization. The proponents of separation professed difficulty in turning from the controversial issues of wage-fixing to the less litigious matters of common concern, but those accustomed to this practice denied that they experienced any embarrassment. The conclusion must be that whatever arrangement has proved suitable in a particular industry had better be left in being.

I.E.E. Sectional Visits

THE I.E.E. Utilization Section will pay a summer visit to Oxford on 9th May when there will be a conducted tour of the Clarendon Laboratory in the morning. After luncheon at the Forum Restaurant visits will be paid to Magdalen, Christ Church and Merton Colleges, and high tea will be served in the Hall of the last-mentioned college.

The summer visit of the Measurements Section will be to Southampton Docks on Saturday, 13th June, to inspect King George V dry dock and the pumping station, followed by a steamer trip to view the warships assembled at Spithead for the Coronation review.

The Radio Section is arranging a one-day summer visit to Cambridge on Saturday, 4th July.

ELECTRICITY SUPPLY

Higher Charges in East Midlands

Northumberland Inquiry Decision

INCREASED electricity charges estimated to produce £788,000 during 1953–54 were announced at last week's meeting of the East Midlands Electricity Consultative Council at Nottingham. Mr. C. R. King, chairman of the Board, said that there had been a loss of £825,783 for the year ended 31st March, 1952, and it was probable that the deficit for 1952–53 would be not less than £300,000. The recent 10 per cent rise in coal prices would increase the cost of electricity purchased by the Board by £850,000 a year, about half of which would be recovered from industrial consumers by the operation of coal clauses in their contracts. It was felt that in equity the substantial increase in costs should be borne by all classes of consumers and not by industrialists alone.

The revised charges, which come into force as from the first routine meter reading on or after 1st April, are as follows:—

DOMESTIC TARIFF. First block at 4½d/kWh and remainder at 1d/kWh (instead of 4d and ¾d). This revision is estimated to produce an additional revenue of £700,000.

INDUSTRIAL TARIFF C (alternative tariff not subject to coal clause). First 3,000 kWh per quarter at 2d (against 1¾d), next 3,000 at 1¾d (1⅝d) and remainder as before at 1½d/kWh.

COMMERCIAL AND MISCELLANEOUS PREMISES, COMBINED PREMISES AND FARM TARIFFS. Pending the introduction of standard tariffs later in the year, all existing flat rate or block tariffs for lighting are to be increased to 4½d/kWh if below that figure, but tariffs for restricted-hour lighting remain unchanged. "Unit" charges of two-part, flat rate, or block tariffs for purposes other than lighting are increased to 1d, except where subject to a coal clause.

Overhead Line Inquiry Decision

The Ministry of Fuel and Power has rejected objections by Mr. F. C. Batey, farmer, of Stocksfield (Northumberland) against the erection of overhead lines across his farm by the North Eastern Electricity Board. An inquiry into the matter was held some weeks ago. The question arose when Mr. Batey asked the Board if it could supply electricity from the proposed line to certain farm buildings, which were only 35 yards from the overhead line. When Mr. Batey was told that the cost would be £650 including about £400 for a transformer he decided to draw attention to the matter by refusing to allow the Board to erect its lines on his land. The Ministry of Fuel, in overruling Mr. Batey's opposition, made no reference to the Board's charges for supplying his farm premises. Mr. Batey, who has the support of the National Farmers' Union and the Country Landowners' Association, is considering what further steps can be taken to get the Electricity Board to fix more modest rates for rural electrification.

Board's Plans at Penrith

Penrith U.D.C. recently expressed surprise at the North Western Electricity Board's "elaborate" plans for reconstructing its Penrith offices and showrooms when the Board had said that it had not sufficient funds to supply electricity to the local Castle Hill housing estate. The Board has pointed out that Penrith is to be the administrative centre of a wide area and a much bigger staff is therefore needed. Penrith is also to be a centre for the demonstration of electrical agricultural appliances.

Dust Nuisance

Newcastle-on-Tyne City Council has taken up with the British Electricity Authority complaints that dust is being blown across the Tyne on to the west end of the city from Dunston power station. The Council has been informed by the B.E.A. of the methods already used to reduce the dust nuisance and the Authority has promised to improve the system further. People living in the west end of Newcastle say that the dust is a bluish-grey colour and has been a nuisance for a considerable time.

Ash Disposal

Blyth (Northumberland) Town Council has decided not to allow waste from the proposed Cambois power station to be tipped in the borough. The county planning officer has informed the Council that tipping into the sea may be decided upon.

Farmers Not Using Enough Electricity

The Bridgwater Branch of the National Farmers' Union was told at a meeting on 25th March that farmers were not using enough electricity. A letter from the district manager

of the South Western Electricity Board stated that unless farmers in rural areas were prepared to use electricity to a much greater extent than in the past, few further extensions of mains could be carried out. It could almost be said that unless the large majority of prospective consumers in rural areas were prepared to use electricity for cooking and water heating as well as lighting, insufficient revenue would be obtainable to justify the capital expenditure.

Representation on Consultative Council

At last week's meeting of the South Wales Electricity Consultative Council Mr. R. G. Williams, the Council's secretary, said that when the Cardiff City Council approached the Consultative Council (in January) regarding the domestic tariff a suggestion was made that there should be a separate committee for the Cardiff area. Subsequently, this was placed before the Organization Committee. The Committee thought it unwise to set up a separate committee for any local authority area because it could mean having as many committees as there were local authorities. However, since Cardiff had so many consumers, it was thought desirable to give it added representation on the Central Sub-Area Committee, and it was suggested that the Cardiff Council should be invited to have two further members co-opted on to that Committee. The Consultative Council approved this suggestion.

Protest Against Beirut Action

The French and Belgian Governments have protested to the Lebanese Government about its taking over of the Beirut electricity undertaking. This concern is owned by a Franco-Belgian company and was taken over by the Lebanese Government because of the company's alleged failure to improve the domestic and industrial supply in Beirut under the terms of its concession.

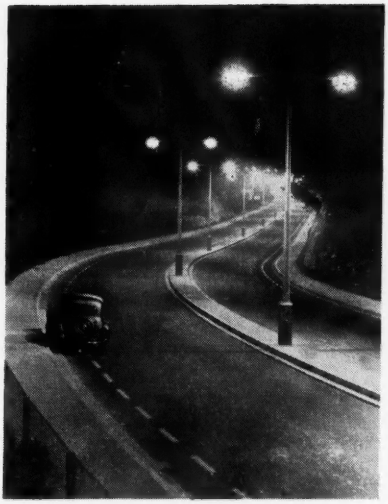
Rutherglen Reinforcement

To meet the increasing load on the electricity network in Rutherglen, the S.W. Scotland Electricity Board has approved a scheme of reinforcement at an estimated cost of £14,195. The scheme includes the establishment of a new substation in East Main Street.

Street Lighting

PADDINGTON Borough Council Works Committee recommends the adoption of a general policy for the conversion of the existing gas street lighting in the borough to electric lighting over a period of ten years. During 1953–54 it is proposed to change over the lighting in a number of roads at a total estimated cost of £27,201.

HALIFAX Corporation has approved schemes estimated to cost £10,800 for the improvement of street lighting in a number of thoroughfares.



Kloof Road and Mount Road, Port Elizabeth, South Africa, have recently been provided with a modern lighting installation comprising 168 Metrovick "S.O. Fifty" all-plastic totally enclosed lanterns housing 140 W sodium lamps

BRIGHOUSE Corporation proposes to make provision in the estimates for 1953–54, for the installation of Class "B" lighting at Rastrick at an estimated cost of £2,670.

HESTON and ISLEWORTH Works, Baths and Fire Brigade Committee recommends that application should be made for permission to borrow £6,280 for installing fluorescent lighting in Staines Road, Hounslow, between the Regal Cinema and Barrack Road.

HIGHAM FERRERS Town Council has approved in principle a scheme estimated to cost £1,760 for the installation of 40 electric lamps along trunk road, A.6.

SCARBOROUGH Corporation reports that the divisional road engineer of the Ministry of Transport is prepared to consider an application for the conversion of the lighting of route A.165 from gas to electricity, starting from Westborough across the Valley Bridge towards Filey, at a cost not exceeding £6,000.

It is estimated that the cost of converting HORBURY's remaining gas-lit streets to electricity will be £8,000. The U.D.C. is planning to spend up to £1,000 on this work next year.

BEDLINGTON U.D.C. is to carry out improvements to street lighting from Bedlington to Stakeford.

ULVERSTON U.D.C. has agreed to ask the North Western Electricity Board to prepare a comprehensive scheme for electric street lighting throughout the urban district.

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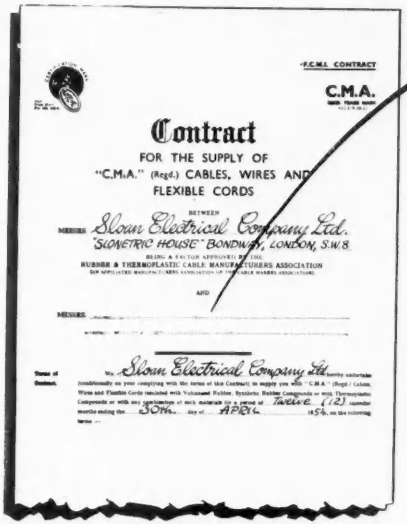

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Terms of Contract. We Sloan Electrical Company Ltd hereby undertake (conditionally on your complying with the terms of this Contract) to supply you with "C.M.A." (Regd.) Cables, Wires and Flexible Cords insulated with Vulcanised Rubber, Synthetic Rubber Compounds or with Thermoplastic Compounds or with any combination of such materials to the extent of Twelve (12) calendar months ending the 30th day of April 1954 at 5% on the following terms :—

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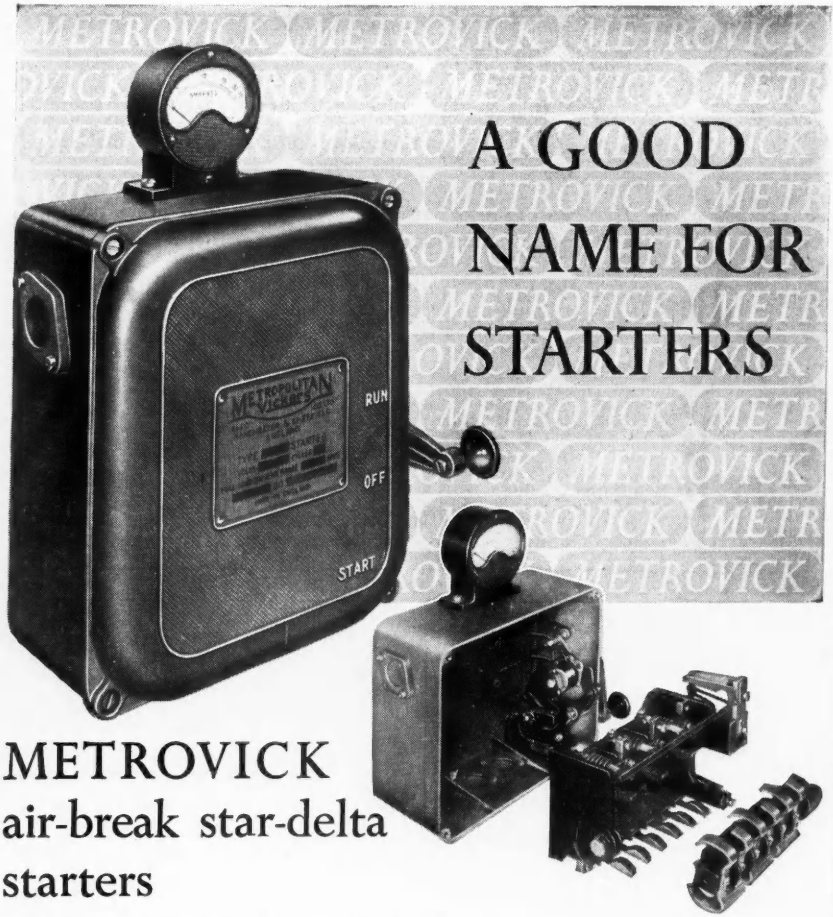

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The Metrovick reputation is based on sound engineering design and good workmanship. The standard is maintained in the type ASD series of starters which conform with BSS.587. They are suitable for squirrel cage motors up to 25 H.P. 650 volts

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 13th May, from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1948

15577. Philips Electrical, Ltd.—Method of manufacturing cathode-ray tubes. 9th June, 1948. (691293.)

20013. Armour Research Foundation of Illinois Institute of Technology.—Magnetic impulse record member and method of making same. 27th July, 1948. (691463.)

22696. Stadium, Ltd., and Hefford, C. G.—Electric battery lamps. 29th August, 1949. (691464.)

31814. Swift, C. W., and Phillips, H. A.—Electrical apparatus for the production of engraved printing surfaces. 12th July, 1949. (691295.)

1949

2035. British Thomson-Houston Co., Ltd., Davies, L. J., and Beeson, E. J. G.—Electric discharge lamps. 12th January, 1950. (691297.)

4271. Postmaster General.—Photo-electric scanning. 15th February, 1950. (691465.)

6029. Welding Supplies, Ltd. (Elektriska Svetsningsaktiebolag).—Welding rods, particularly for hard facing purposes. 4th March, 1949. Convention date not granted. (691298.)

10835. Lopez, C. R.—Electric-energy meters. 23rd April, 1949. Cognate application 10836, 2nd August, 1948. (691299.)

12482. Lincoln Electric Co.—Arc welding flux compositions and methods of making same. 10th May, 1949. (691527.)

14354. Tinsley (Industrial Instruments), Ltd., and Steghart, F. L.—Electrically-operated apparatus for controlling pressure or flow. 2nd June, 1950. (691348.)

25229. Patent-Treuhand-Ges. für Elektrische Glühlampen Ges.—Method of producing a coating layer of fine grained pulverulent material on the glass vessels of electric lamps and the like. 30th September, 1949. Cognate application 25230. 23rd May, 1949. (691305.)

27501. National Research Development Corporation.—Electrically-operated apparatus for summing the readings of indicating and recording instruments. 26th January, 1951. (691471.)

28147. Hunt, Ltd., A. H.—Electrical circuits and circuit components. 31st January, 1951. Cognate applications 31923, 13th December, 1949, and 14432, 9th June, 1950. (691308.)

1950

7358. Parrish, E. W.—Heavy duty switch for the battery circuit of a vehicle internal-combustion engine. 22nd March, 1951. (691532.)

8004. British Thomson-Houston Co., Ltd., Beeson, E. J. G., and Webb, A. A.—Electric-discharge lamps. 6th March, 1951. (691316.)

8097. Radiation, Ltd.—Thermally controlled electric switch for controlling an electromagnetically-operated gas burner control valve. 8th March, 1951. (691481.)

10517. General Electric Co., Ltd., and Donelan, J. A.—Processes for electric arc welding and apparatus for carrying out such processes. 27th April, 1951. (691373.)

19610. Tesla, National Corporation, and Zima, M.—Multiple amplifier assemblies. 4th August, 1950. (691538.)

19622. Ercolino, M. D.—High-frequency antennas. 4th August, 1950. (691485.)

19713. British Thomson-Houston Co., Ltd.—Organopolysiloxane oils. 8th August, 1950. (691486.)

20029. General Electric Co., Ltd., Matthews, A., and Polgreen, G. R.—Electromagnetic measuring instruments. 30th July, 1951. (691384.)

20072. Thorn Electrical Industries, Ltd.—Luminescent materials. 23rd July, 1951. (691539.)

23334. Minister of Supply.—Method for the manufacture of radio lens structures. 24th September, 1951. (691322.)

23867. Babcock & Wilcox, Ltd.—Forced flow, once through, tubulous boiler units. 29th September, 1950. (691324.)

24461. British Thomson-Houston Co., Ltd., and Carfrae, W. J.—Measurement of alternator field currents. 5th October, 1951. (691382.)

25032. English Electric Co., Ltd.—Splined clutches. 12th October, 1951. (691413.)

25349. Bond, R.—Calculating appliance for evaluating electrical quantities. 18th October, 1951. Cognate application 25350, 18th October, 1950. (691542.)

27206. British Thomson-Houston Co., Ltd.—Suspensions of polymeric chlorotrifluoroethylene. 7th November, 1950. (691550.)

27462. Mullard Radio Valve Co., Ltd.—Travelling-wave tubes. 9th November, 1950. (691399.)

28156. Philips Electrical Industries, Ltd.—High-frequency band-pass filters. 17th November, 1950. (691333.)

29703. Dominitwerke Ges.—Electric cap lamps. 5th December, 1950. (691416.)

29976. Philips Electrical Industries, Ltd.—Arrangement for securing the flange of an electric discharge tube to a cooling vessel. 7th December, 1950. (691553.)

30509. Minister of Supply.—Quartz-fibre electroscopes. 11th December, 1951. (691557.)

30982. Electric & Musical Industries, Ltd.—Television receivers. 4th December, 1951. (691558.)

30990. Hoover, Ltd.—Floor polishers. 20th December, 1950. (691406.)

31095. Leitz Ges., E.—Methods of making luminescent screens. 21st December, 1950. (691335.)

31400. Telephone Manufacturing Co., Ltd.—Terminals of electrical fittings. 30th November, 1951. (691560.)

31472. Cooper, F. T.—Microphones. 28th December, 1950. (691562.)

1951

862. Thorn Electrical Industries, Ltd.—Treatment of phosphors. 11th January, 1951. (691563.)

3198. Westinghouse Brake & Signal Co., Ltd., and King, K. G.—Apparatus for the control of voltage and like regulators. 30th November, 1951. (691339.)

4667. Soc. d'Electronique et d'Automatisme.—Electric selective control systems comprising magnetic amplifiers. 26th February, 1951. (691340.)

5623. Research Corporation.—Apparatus for energizing electrical precipitators and the like. 8th March, 1951. (691341.)

5924. Avery-Hardoll, Ltd.—Coupling devices for pipes or conduits. 7th December, 1951. (691568.)

6905. Metropolitan-Vickers Electrical Co., Ltd.—Radar-testing equipment. 21st March, 1952. (691570.)

10372. Newmark, J. M., and Newmark, A. S.—Electromagnetically actuated pump for a spraying device. 22nd August, 1951. (691439.)

10507. General Electric Co., Ltd., and Bradshaw, S. E.—Manufacture of crystal contact devices. 17th April, 1952. (691495.)

13179. Philips Electrical Industries, Ltd.—Electron beam switching tubes. 4th June, 1951. (691577.)

15762. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 3rd July, 1951. (691446.)

15862. Schlumberger Overseas Soc. Anon. -Phase-selective networks. 4th July, 1951. (691344.)

19362. British Thomson-Houston Co., Ltd.—Treatment of mica and the production of sheets therefrom. 16th August, 1951. (691452.)

19697. British Thomson-Houston Co., Ltd.—Capacitor electrodes. 21st August, 1951. (691509.)

23014. Landers, Frary & Clark.—Control means for flat irons. 3rd October, 1951. (691453.)

23941. British Thomson-Houston Co., Ltd.—Dies for high-temperature applications and iron alloys therefor. 3rd October, 1951. (691518.)

23403. Bendix Aviation Corporation.—Voltage regulating system. 8th October, 1951. (691519.)

25670. Standard Telephones & Cables, Ltd.—High Q frequency tuner. 2nd November, 1951. (691580.)

25765. National Research Development Corporation. —Airlines having electrical conductors and couplings therefor. 3rd November, 1951. (691581.)

26760. Swift, C. W., and Phillips, E. A.—Electrical apparatus for the production of engraved printing surfaces. 12th July, 1949. Divided out of 691295. (691345.)

26770. Philips Electrical Industries, Ltd.—Methods of making supply cathodes and supply cathodes manufactured by means of these methods. (691583.)

29836. Bohm, O. M., Kibbler, G. O. T. H., and Buckingham, J.—Radio or radar aerials. 20th December, 1951. (691586.)

1952

1537. Landis & Gyr Akt.-Ges.—Arrangement for facilitating the remounting of counting and like mechanisms in measuring apparatus, especially in electricity meters. 18th January, 1952. (691458.)

2068. Allmanna Svenska Elektriska Aktiebolag.— Means for making a regulator alternatively responsive to voltage and current. 25th January, 1952. (691588.)

2603. Martin Co., G. L.—Slotted waveguide antenna array. 31st January, 1952. (691589.)

3147. British Thomson-Houston Co., Ltd.—Refrigerators. 6th February, 1952. (691590.)

4385. British Thomson-Houston Co., Ltd.—Filament mount-testing apparatus. 19th February, 1952. (691459.)

NEXT WEEK'S EVENTS

Tuesday, 7th April

EDINBURGH.—Heriot Watt College, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. "Elementary Industrial Electronics," by J. H. Jones, with films.

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "The Architect and the Electrical Engineer," by T. Dunwoody.

NOTTINGHAM.—E.M.E.B. Denomination Theatre, Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. Ten-minute papers.

Wednesday, 8th April

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. Annual general meeting. Centre chairman's address, by T. S. A. Primrose.

BIRMINGHAM.—James Watt Institute, 6.45 p.m. I.E.E. South Midland Students' Section. "Silicone Insulation," by J. H. Davis.

BLACKBURN.—N.W.E.B. Demonstration Theatre, Darwen Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Aluminium Sheathed Paper Cables," by J. W. Robertshaw.

LONDON.—School of Hygiene & Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, London Section. "Lens Aerials for Centimetric Wavelengths," by Lt.-Col. J. P. A. Martindale.

NEWCASTLE-UPON-TYNE.—Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North-Eastern Section. Annual general meeting, followed by a demonstration of stereophonic reproduction.

NOTTINGHAM.—Welbeck Hotel, 7 p.m. Incorporated Plant Engineers, East Midlands Branch. "Peak Steam Demands and Thermal Storage," by E. G. Ritchie.

STOCKTON-ON-TEES.—Vane Arms Hotel, 7.30 p.m. Institution of Works Managers, Tees-Side Branch. Annual general meeting.

Thursday, 9th April

BIRMINGHAM.—College of Technology, 53, Broad Street, 6.30 p.m. I.E.E. South Midland Education Discussion Circle. "The Devising of Examination Questions," by Prof. G. W. Carter.

GLASGOW.—At the Institute of Engineers & Shipbuilders. British Institution of Radio Engineers, Scottish Section. "Remote Control Devices and Servomechanisms."

GLOUCESTER.—City Library, 7 p.m. I.E.E. Bristol Students' Section. Film Show: "Prelude to Power," "Electrification of the Liverpool Street–Shenfield Railway," and "275 kV Experimental Transmission Line."

KENDAL.—N.W.E.B. Demonstration Theatre, Finkle Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

LIVERPOOL.—Electricity Board's showrooms, Whitechapel, 7 p.m. Electrical Power Engineers' Association, Merseyside Technical Group. "Power Station Lubrication," by G. H. Clark.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. "Special Effects for Television Studio Productions," by A. M. Spooner and T. Worswick.

Polytechnic, Regent Street, 7.30 p.m. Institute of Industrial Supervisors, London Central Section. "Relationships between Management and Trade Unions."

MANCHESTER.—Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "Glass—An Old Material in a New Light," by P. M. Davidson.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7.30 p.m. Incorporated Plant Engineers, Newcastle-upon-Tyne Branch. "Oil Injection Method of Separating and Uniting Joints on Shaft Couplings," by C. S. Clarke.

NOTTINGHAM.—E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. Presidential address by W. J. Wellwood Ferguson.

Friday, 10th April

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. Institute of Fuel, South Wales Section. "Some Aspects of Domestic Heating," by E. Brooks.

CREWE.—Royal Hotel, Nantwich Road, 7.30 p.m. A.S.E.E. Crewe Branch. "Welding," by W. Barnett.

HUDDERSFIELD.—Electricity Showroom, Market Street, 7.15 p.m. I.E.S. Huddersfield Group. Annual general meeting.

LONDON.—Connaught Rooms, Great Queen Street, 6 for 6.30 p.m. Association of Supervising Electrical Engineers. Annual dinner and reunion.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—22nd May. Supply of seventy-two transformers of from 200 to 300 kVA. (C.R.E. 10389/53. Ten/6011.)*

Belfast.—24th April. City Council. Drainage pumping equipment. (See this issue.)

Belgium.—BRUSSELS.—20th May. Belgian State Railways. Supply of thirty-eight express train railcars (mechanical portion without traction gear but with electric heating equipment). (C.R.E. 9074/53. Ten/5996.)*

Greece.—ATHENS.—2nd May. Broadcasting Reconstruction Procurement Committee, Ministry of Communications. Supply of broadcasting equipment and diesel generating plant for Salonica. (C.R.E. 9643/53. Ten/5968.)*

New Zealand.—WELLINGTON.—14th May. Post and Telegraph Department. Supply of 17,000 switchboard lamps. (C.R.E. 10975/53. Ten/6020.)*

Northampton.—13th April. Town Council. Street lighting. (See this issue.)

Radcliffe.—14th April. Corporation. Street lighting equipment. (See this issue.)

Southampton.—Corporation. Electrical subcontract for 73 maisonnettes, Itchen. (See this issue.)

Southern Rhodesia.—SALISBURY.—14th April. Electricity Supply Commission. Supply of 88 kV switchgear, tender No. 1471/53. (C.R.E. 10520/53. Ten/5995.)*

Swanage.—7th April. U.D.C. Installation of electric wiring in 15 Council houses and power points in 15 other houses. P. S. Browne, surveyor, Town Hall.

Turkey.—ANKARA.—15th April. Ankara Elektrik Havagazi ve Otobus Isletme Muessesi. Supply of transformers ranging from 160 to 600 kVA. (C.R.E. 10912/53. Ten/6005.)*

ORDERS PLACED

Coventry.—Education Committee. Electrical installations at Howes Infants' School (£1,049) and Stoke Aldermoor Primary School (£1,157).—Thompson Electrical Co., Kenilworth.

Glasgow.—Corporation. Supply of 18 lanterns required by the Lighting Department for trial installation (£242).—British Thomson-Houston Co., Ltd.

London.—Metropolitan Water Board. Two electrically driven centrifugal pumps required in connection with improvements at the Rock Hill and Norwood pumping stations (£5,665).—James Beresford & Son, Ltd.

Peterborough.—Corporation Estates Committee. Electrical installations in 116 houses on the Dogsthorpe North housing estate (£2,500).—M. F. Hansen.

Swansea.—Housing Committee. Electrical installations in 225 houses, Cadle housing site (£5,598).—South Wales Electricity Board.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Flats (226), in demolition areas; borough engineer, Town Hall, W.3.

Adwick-le-Street.—Fire station (£13,755) to replace converted buildings now in use; county architect, Wakefield, Yorks.

Barnard Castle.—Houses (78), Evenwood and Gainford, for R.D.C.; J. Lawton, architect, 45, Galgate.

Barnoldswick.—Extensions and improvements to Long Ing Foundry (£20,600); Ouzledale Foundry Co., Ltd.

Basingstoke.—Factory extensions; Lansing-Bagnall, Ltd., Kingsclere Road.

Bathavon.—Traditional type houses, Red Post, Peasedown; S. G. Foxton Price, Council Offices, Westgate Buildings, Bath.

Belfast.—Flats (51), Kansas Avenue site; Housing Architect's Department, 94, Chichester Street.

Beverley.—Agricultural institute on site at Bishop Burton; East Riding county architect, County Hall, Beverley.

Birmingham.—Six-storey flats (72), with lift, etc., Hob Moor Road, South Yardley (Contract 291); city engineer, Civic Centre.

Brentford.—Factory extension; Jantzen Ltd., Great West Road.

Bridge-Blean.—Erection of houses on sites at Broad Oak, Littlebourne and Adisham; surveyor, Rural Council Offices, Canterbury.

Bristol.—Sections of scheme for Council House at College Green; J. N. Meredith, city architect, Eagle House, Colston Avenue, 1.

Carlisle.—Ante-natal clinic and midwifery training school at the City Maternity Hospital; N. Edgar, Hospital Board's divisional architect, 1, Lonsdale Street.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Carlton. — Bungalows (36), Burton Road, Gedling; J. R. Campbell, U.D.C. surveyor, Council House, Burton Road.

Chichester.—Houses (116), Park estate; city surveyor.

Corby.—Factory; John White Footwear, Ltd., Higham Ferrers.

Dartmouth.—Houses (47), Townstal housing estate; borough surveyor, 12, Victoria Road.

Dewsbury.—Works extensions, Edge Lane; James Austin & Sons (Dewsbury), Ltd., Thornhill Works.

Droitwich.—Three-storey flats at Wychbold, and 30 "Cornish Unit" dwellings; R.D.C. surveyor.

Durham.—Additions to Walworth Castle residential school (£50,000); R. Blackett & Sons, Ltd., builders, Bondgate, Darlington (fresh tender).

Grammar school, Consett; county architect, Court Lane, Durham.

Eccles. — Rebuilding Bull's Head Hotel, Church Street; Joseph Holt, Ltd., Derby Brewery, Manchester.

Enfield.—Houses and flats (231) on sites at Manor Farm; F. Lee, surveyor, 7, Little Park Gardens.

Eston.—Houses (22), Redcar Road East estate, for U.D.C.; N. C. Harrison, surveyor, South Bank-on-Tees.

Evesham. — Shopping centre at Fairfield estate; borough surveyor, 1, Leicester Gables, High Street.

Exeter.—Shop and offices, High Street; Thomas Vanstone & Sons, Ltd., builders, Union Terrace, Torquay.

Garstang.—Houses (36), Catterall; R.D.C. surveyor.

Gorleston. — Crematorium; borough surveyor, 15, Regent Street, Great Yarmouth.

Jarrow. — Shops (12), Ormonde Street; H. W. T. Perkins, borough engineer.

Kent.—Primary school at Dartford, and extensive additions to girls' grammar school, Clarendon House, Ramsgate; County architect, Springfield, Maidstone.

London. — GREENWICH. — Dwellings (101), Pond Road; Richardson & Houfe, architects, 31, Old Burlington Street, W.1.

ST. MARYLEBONE.—Primary school, Cosway Street; Poulton & Freeman, architects, 6a, Wyndham Place, W.1.

Londonderry.—County intermediate school for boys, Carthall, Coleraine; County Education Offices, New Row, Coleraine, Co. Londonderry, N. Ireland.

Luton.—Houses and flats (144), on six sites in the rural area; J. A. Murch, R.D.C. surveyor, 73, West Parade, Dunstable.

Maidstone.—Houses (70), Marden, Yalding and Coxheath; G. G. Letchford, clerk to R.D.C., Council Offices, 26, Tonbridge Road.

Manchester.—Five-storey offices and showrooms for D. Rosenfield, Ltd.; Drury & Gomersall, architects, Oxford Road, Manchester.

Margate.—Factory, Westwood estate; Emco Brass Manufacturing Co., Ltd., Terminal Building, Croydon Airport.

Flats (92), and shops, at Zion Place; W. L. Armstrong, borough surveyor, 38, Grosvenor Place.

Middlesbrough.—New Middle Beck No. 1 County Secondary School (£164,000); Leslie & Co., builders, Woodlands Road, Darlington (revised tender).

Millom. — Additions to grammar school; J. H. Haughan, county architect, 15, Portland Square, Carlisle.

Newcastle-on-Tyne.—Art school (£7,500) and home for 47 old people (£15,000); city architect, 18, Cloth Market.

Three-storey flats (840 flats) at Longbenton; city architect, 18, Cloth Market.

Norton.—Flats on the Model Farm estate and at junction of East Road and Eastfield Avenue; F. Vaux, architect to U.D.C., 31, Quay Road, Bridlington.

Peterborough. — Housing estate, Rose Gardens; B. Stokeley, builder, Henry Street.

Portsmouth.—Flats and maisonnettes (48), Havant Street; P. McG. Corsar, architect, 103, Commercial Road.

Redditch.—Houses (56), Batchley estate; E. Buckley, U.D.C. surveyor, Council House, Redditch, Worcs.

St. Albans.—Houses (40), Saxon Road, Wheathampstead; architect to R.D.C., 43, Upper Lattimore Road.

Salford.—Grammar school (720 places) at Claremont, Eccles Old Road; Taylor & Young, architects, 195, Oxford Road, Manchester, 13.

Sheffield.—Flats at Manor Park and Greenhill-Bradway estates; city architect.

Smethwick. — Conversions at Holly Lane Isolation Hospital to form centre for brain surgery (£86,000); Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

South Molton.—Additions to Council offices, East Street; surveyor, Council Offices, 7, East Street, South Molton, Devon.

Stockport.—Additions and conversions at premises in Hempshaw Lane, to provide laboratory, classrooms, etc.; W. F. Gardner, borough surveyor, Town Hall.

Walsall.—Four-storey maisonnettes at Bath Street, and two-storey flats at Green Lane; M. E. Habershon, borough surveyor, Council House.

Walton and Weybridge.—Flats (64), at Thrupps Lane, Hersham, for U.D.C.; W. H. Harris, clerk, Council Offices, Walton-on-Thames.

Watford.—Slaughterhouse, Holywell; S. C. Sage, borough surveyor, Town Hall.

Weardale. — Houses (26), Stanhope, for R.D.C.; architect, Council Offices, Stanhope, Co. Durham.

Wellington (Som).—Home for the blind at The Court; R. O. Harris, architect, Park Street, Taunton.

West Hartlepool.—Sixteen flats in Browning Avenue; borough architect, Municipal Buildings.